AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

Welding Design & Fabrication

ESTABLISHED IN 1930 AS INDUSTRY & WELDING

NOVEMBER 1961

STEVENS RICE
UNIVERSITY MICROFILMS
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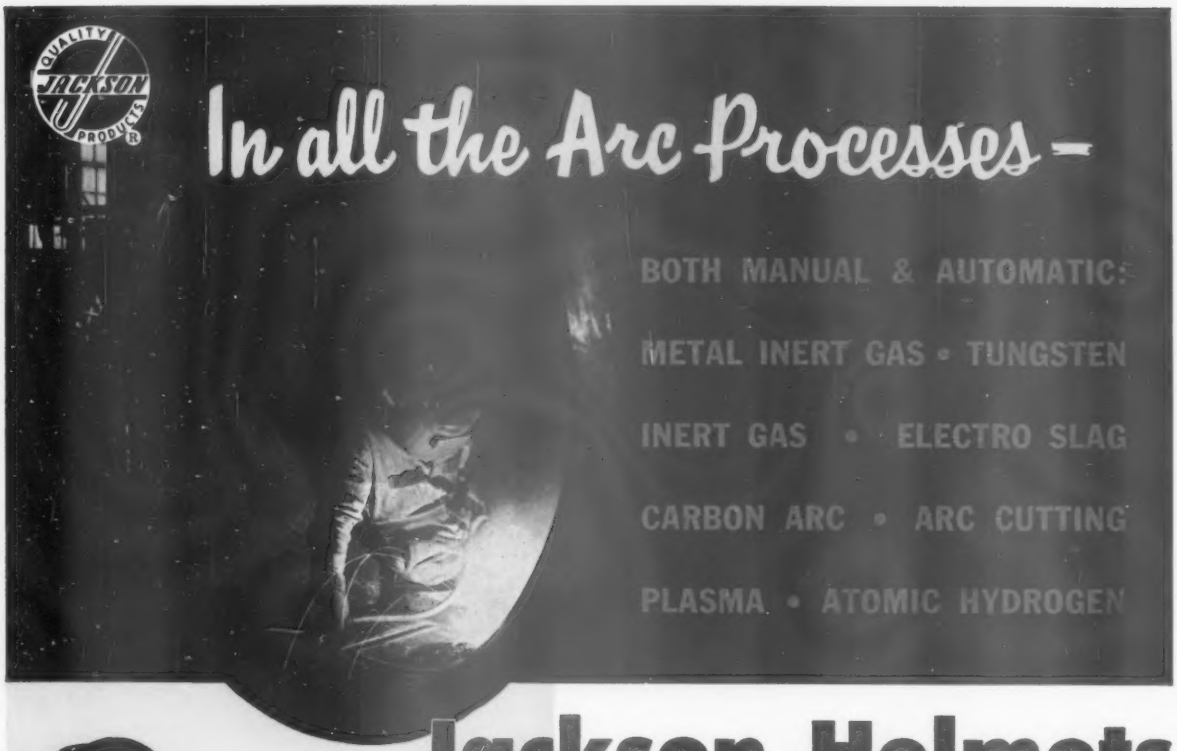
MIR75

WELDING CANADA'S FIRST URANIUM REACTOR



Jackson Helmets Do their Job

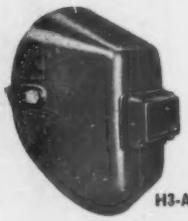
Just pick what's best for you—Jackson offers twenty different models. Choose the shape you like, the material you like, the lens holder you like. Add Jackson's non-conductive friction pivots, all-nylon Adjust-O-Lok headgear, and adjustable helmet stop. Check on the quality Jackson line soon.

H2-A

Curved Shell Fiber Glass
With Choice of three lens holders.
Shown: handy plastic lift-front type.

H-10A

Curved Shell Vulcanized Fiber
With choice of three lens holders.
Shown: front-loading metal holder.



H3-AP

Narrow Shell Fiber Glass
With choice of three lens holders.
Shown: non-conductive plastic holder.

H-80AP

Straight Shell Vulcanized Fiber
With choice of three lens holders.
Shown: non-conductive plastic holder.

H9-A

Straight Shell Fiber Glass
With choice of three lens holders.
Shown: handy lift-front type.

Left: Five different handshields are available.
Right: All Jackson Helmets may be bought in combination with any of three Jackson safety caps.

Jackson Products

AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

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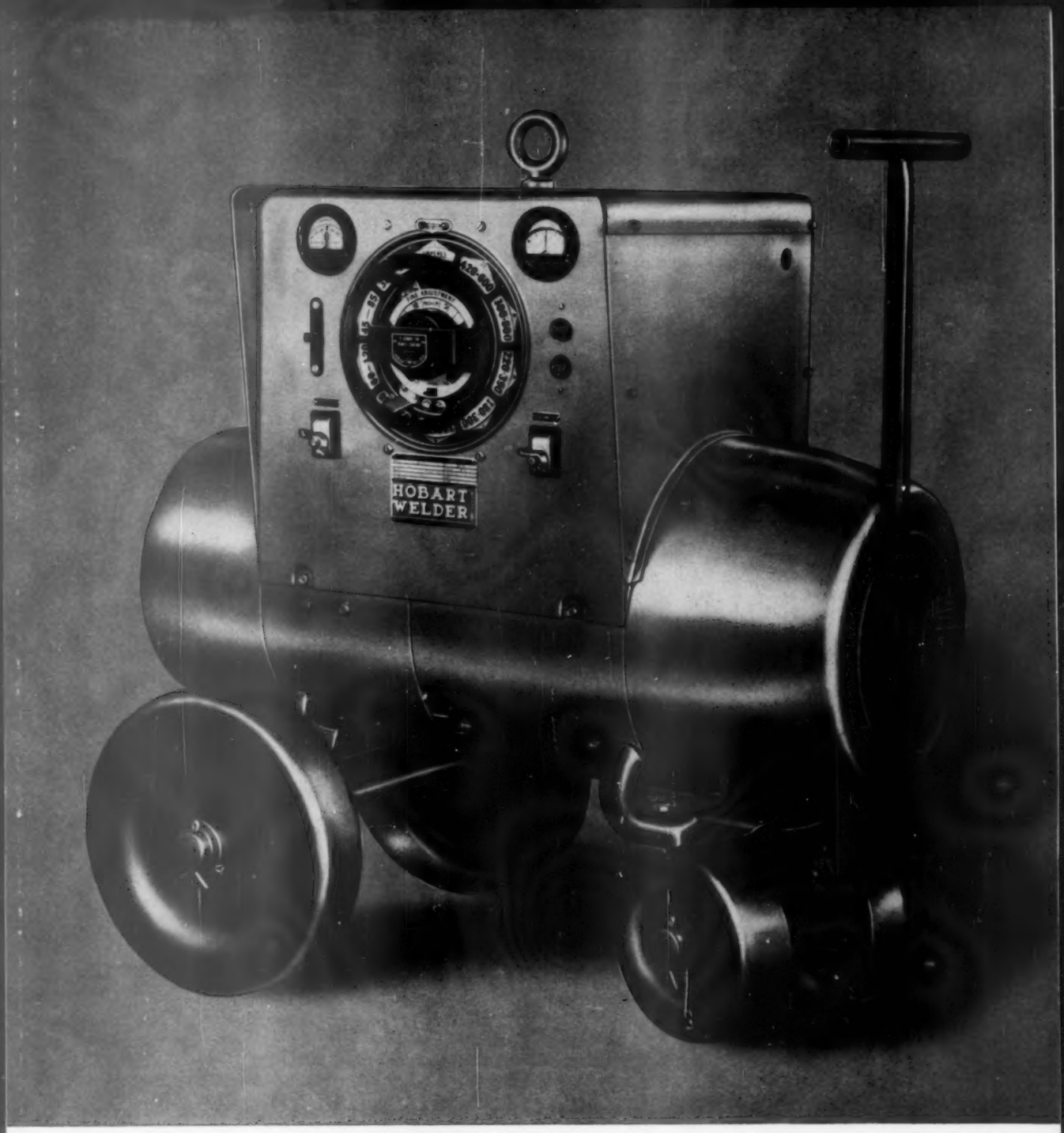

Model MP-304-P

Best selling Hobart welder gets a NEW LOOK

Why make changes in a best seller? To give you even more for your money! Notice the new visored canopy and the easy to read Multi Range Control. The new canopy adds more than style—it protects controls, meters, switches and terminals from damage. The new control switch is plainly marked—permitting operators to make up to 1,000 volt-amperage adjustments faster, more accurately. The popularity of Hobart Welders continues to grow year after year because of constant improvements in welder design and performance. Discover how a Hobart motor generator welder can profitably go to work for you. Write for bulletin DM-101 today.

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Manufacturers of the world's most complete line of arc welding equipment
International Sales, Hobart Brothers A.G., Box 5500, Nassau, Bahamas

reader's guide to

for November, 1961

COVER: Semi-automatic welding makes it possible to make long, contoured welds in limited space on the dump slot for Canada's first natural uranium reactor. The prototype reactor at Rolphton, Ontario, is using natural uranium to give a 20,000 kilowatt demonstration of Canada's nuclear future. The project is being sponsored by the Atomic Energy Commission of Canada, Ltd., the Hydro-Electric Power Commission of Ontario, and the Canadian General Electric Company. See page 33.

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FEATURES

21 SPOT LIGHT ON FABRICATING
Case histories show how welding fabricators are making products of extreme size to close tolerances.

33 WELDING CANADA'S FIRST NATURAL URANIUM REACTOR
The reactor core for Canada's first natural uranium reactor contains over 4 miles of welding. It is virtually inaccessible for welded repairs once it goes into operation.

35 CIRCLES: A NEW JOB FOR PRESS BRAKES
Want to get more work out of your press brake? A leading manufacturer did by using special, quick-acting tooling.

37 THREE-HUNDRED-THOUSAND WELDING OPERATORS NEED SAFETY SHOES
This is one of the most important facts to come out of a survey conducted throughout the welding industry by Robert A. Anderson, assistant editor.

40 THE PROS AND CONS OF STRESS RELIEVING
Experience may justify the elimination of stress relief in some cases, but the author feels stress relieving is good insurance against failure when in doubt.

50 BRAZING KNOW-HOW MEETS JET-AGE REQUIREMENTS
This company uses $1½-million worth of modern equipment, designers, and metallurgists to develop furnace brazing techniques for unusual metals and complex assemblies.

53 AUTOMATIC WELDING KO'S IMPELLER RIVETS
The experts had to admit they were wrong when Allis-Chalmers proved they could weld impellers automatically—and make them better in every way.

55 WORLD'S LARGEST ELECTRON BEAM WELDER MAKES NUCLEAR FUEL ELEMENTS
Westinghouse welds aluminum-clad nuclear fuel elements to close tolerances with extremely narrow heat-affected and fusion zones.

56 STUD WELDING SOLVES SUPERSONIC PROBLEM
Stud welded flexure bolt assemblies permit the stainless steel inner side of a wind tunnel's variable diffuser to expand and contract with reference to the outer side.

58 FLAMECUTTER TRIMS WELD PREPARATION COSTS 67%
If your cylinders are getting thicker, heavier, and harder to turn, do what Foster-Wheeler did: Make the torches do all the work.

DEPARTMENTS

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84 OPPORTUNITIES

Avco puts the PlasmaGun to work—in your plant

This Avco PlasmaGun spray-coats metals, ceramics and refractories with a thickness, density and bond strength never before possible—right on your production line.

It sprays uniformly without clots or streamers at roughly half the cost of other plasma equipment. And you can save up to 30% over conventional spray-coating—even more when fabricating free-standing parts from materials such as tungsten.

The Avco PlasmaGun takes powders previously too fine for other plasma equipment. The cathode is adjustable, too, for convenience and economy. (No need to switch cathodes each time you change powders.)

The cost? Lower than you think. It can pay for itself on the first job. Maintenance? Easiest of any gun in the field. (The PlasmaGun assembles with only 4 bolts!) Warranties? On all parts, for six months. (Another exclusive Avco feature.)

AVCO *Research & Advanced Development* division

Avco's special PlasmaGun booklet describes the complete system. Send for your free copy right now!

AVCO Research and
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Please send free information about new PlasmaGun system.

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More Delivered Power for FASTER, CHEAPER
Cuts Thru LARGER Solids and Shapes

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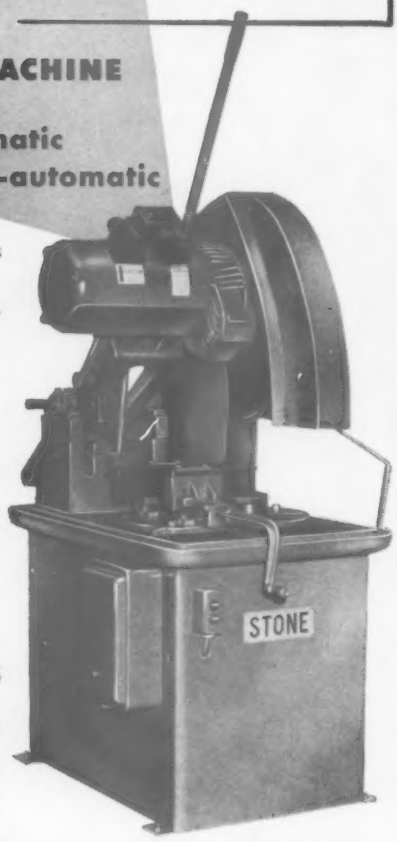
CUT-OFF MACHINE
manual
semi-automatic
fully-automatic

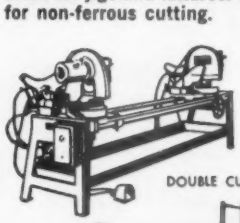


Delivering 15 hp to the spindle, this new heavy-duty, high-speed addition to the Stone "world's most complete line," will slice quickly through a wider range of ferrous, non-ferrous and non-metallic solids and shapes. These 20″ and 24″ saws . . . driven at constant speed by an induction-type, geared-in-head motor . . . cut to mill-like finishes and tolerances. No hardening of stock. No change in characteristics.

Has stationary wheel guard for maximum safety. May be equipped for wet or dry, manual, semi-, or fully automatic cutting. With automatic barfeed, the M-160 actuated by electro-air oil-check makes up to 1600 cuts per hour.

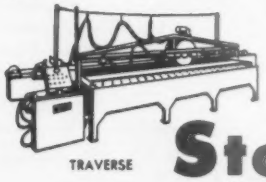
ALL THESE STONE FEATURES

Geared-in-head, T.E.F.C., ball bearing 208/220/60/3 or 440/60/3 motor with load ammeter, overheating indicators, and No. 2 magnetic starter. Fast acting, self-centering vise, adjustable to 46° cutting, clamps close to cut regardless of angle. Heavy, cast machined table ideal for jigs and fixtures. Oil mist spray for non-ferrous cutting.


DOUBLE CUT

DOUBLE MITER

AUTOMATIC CHOP STROKE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OUT-OF-PRINT COPIES of WELDING DESIGN & FABRICATION are available in complete volumes as positive microfilm copies from University Microfilms, 313 N. First Street, Ann Arbor, Michigan.

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NEW Dockson GAUGELESS REGULATORS for every purpose!

A simple turn of the "T" handle on the micrometer-type pressure regulator cap quickly sets and maintains desired working pressure.

Fully protected, positive-reading, damage-proof indicator rod fills viewing hole when tank is full, retracts as tank empties. When tank is empty, the rod disappears from view.

Each regulator is carefully tested and individually calibrated. Adjustment scales are clearly etched on the bonnet for permanent, easy reading.

Single-Stage Model #61

Heavy-duty solid forged brass bodies and bonnets.

SAFE, RUGGED, ACCURATE!

- **Unharmed by normal blows and falls.**
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- **Popularly priced for the budget buyer.**

Rough handling, bumps, and falls don't faze Dockson's rugged, new, all-metal gaugeless regulators. Backed by over thirty years of engineering experience, and using only the finest material available, Dockson engineers have designed these economical regulators to give you better service, over a longer period of time, at prices below the cost of conventional glass-faced gauge regulators. A minimum of moving parts; self-aligning, easily replaceable seats; dependable safety valves; sensitive, sturdy metal diaphragms which work WITH, not against pressure — all add up to savings for you. Available in single-stage (#61) and two-stage (#261) models.

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Dockson CORPORATION

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STRENGTH +
LIGHT WEIGHT
That's the Beauty of Steel

DESIGN NOTE: The Military Ranger used N-A-XTRA 90 (minimum yield strength, 90,000 psi) in bars and plates ranging to 1" thick, in main frame and cross members, loader mechanism and fork carriage. Fabrication followed standard gas cutting and welding procedures. Excellent weldability of N-A-XTRA was important in joining to other steels.

N-A-XTRA 90 plates and bars are used in the "Ranger," a rough terrain military vehicle designed, developed and fabricated jointly by the U. S. Army Quartermaster Corps and the Clark Equipment Company, Battle Creek, Michigan. The Ranger series is manufactured by the Industrial Truck Division of Clark Equipment Company.

Great Lakes Steel is a Division of

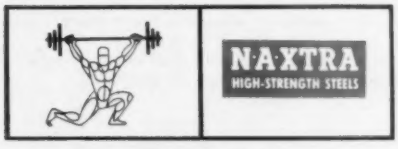
ROUGH TERRAIN MILITARY FORK TRUCK USES N-A-XTRA HIGH-STRENGTH STEEL FOR MAXIMUM LOADABILITY WITH MINIMUM WEIGHT

The U. S. Army needed a material handling truck in 6, 10 and 15 thousand-pound-capacity sizes that would, among other things, operate in five feet of salt water . . . traverse sand beaches, rough terrain . . . climb 45% grades at a minimum of 2.0 m.p.h. . . . 15.0 m.p.h. loaded on the highway . . . load and unload from the far side of a flat car . . . tilt loads 30 degrees back, 45 degrees forward, 10 degrees from the horizontal left or right. *And all this within dimensional and weight requirements that would allow air transport of the vehicle.*

The U. S. Army Quartermaster Corps and the Industrial Truck Division of Clark Equipment Company came up with the answer—the Military Ranger. It meets or exceeds every operating requirement. And does it within the vital weight limit by using N-A-XTRA 90 high-strength steel in main frame, cross members, loader mechanism and supporting structure. N-A-XTRA handles the job in these high-stress areas, yet weighs three times less than mild carbon steel of equivalent strength.

You may never have to air-lift your equipment, but that's not the only problem N-A-XTRA solves. Rugged operating conditions, heavy loads and weight-saving construction—in such applications as, for example, heavy machinery and pressure vessels—are challenges that N-A-XTRA is designed to meet and beat.

With excellent weldability, formability, and toughness even at subnormal temperatures, N-A-XTRA low carbon, extra-strength alloy steels give superior results with conventional fabricating methods, including cold forming, gas cutting, shearing and machining. N-A-XTRA high-strength steels are available in four levels of minimum yield strength, from 80,000 to 110,000 psi, and in sizes ranging from $\frac{1}{8}$ to $1\frac{1}{4}$″ thick, up to 72″ wide and up to 35′ long. For further information, write Great Lakes Steel Corporation, Product Development, Dept. WDF-16, P. O. Box 7310, Detroit 2, Michigan.



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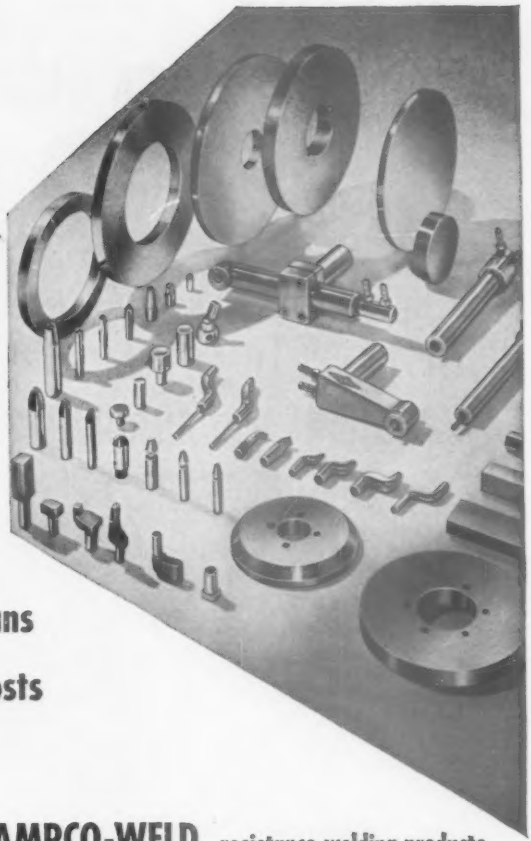

You've Got What It Takes

for longer runs and lower costs

...when you use AMPCO-WELD resistance-welding products

Every item in the complete Ampco-Weld line is manufactured under strict laboratory control to give you longer runs and lower costs.

AMPCO-WELD spot-welding tips — stay cooler — won't stick to the work . . . tough — resist mushrooming and wear . . . fewer dressings needed — they last longer, cost less.

AMPCO-WELD rod — is available from stock — either in rounds, including hex, or in square and rectangular bars. There's a size for every need — all feature Ampco toughness and high electrical conductivity.

AMPCO-WELD seam-welding wheels — many users report 150% longer life. Resist wear — even at elevated temperatures. High electrical conductivity. Get them on short notice as rough forgings, finished blanks, or fully machined.

AMPCO-WELD resistance-welding holders — to suit every job — straight, offset, and universal ejector models. Offset and universal holders have interchangeable sockets for No. 1 and No. 2 Morse tapers. You change tapers without changing holders.

All Ampco-Weld resistance-welding products meet or exceed RWMA specifications. Experienced engineering service is also available. Get what it takes to lower your resistance-welding costs — get Ampco-Weld, the best value for your resistance-welding dollar.

RW-15

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Main Office and Plant • Milwaukee 1, Wis.
Garland, Texas • Huntington Park, Calif.

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LETTERS

to the editor

COMPLAINTS

Editor:

I am writing for myself and thousands of welding operators who have to wear glasses.

Why doesn't someone make a goggle and helmet that will prevent splatter from entering and ruining our glasses? And, why doesn't someone develop a coating that could be applied to protect our glasses? If these products are already on the market, I'd like to know about it.

John Basso
Owosso, Michigan

• *We'll be glad to forward to Mr. Basso any information that our readers care to contribute.*

REPRINTS

Editor:

I should be glad to receive your permission to reprint your article on "Prestressed Steel Beams Replace Concrete" that I saw reprinted in STEEL CONSTRUCTION DIGEST.

We publish a quarterly magazine "STEELWORK IN SOUTH AFRICA" and I will send you a copy of the issue in which your article appears.

R. McHalfie Clark
Director
Structural Steel Publicity
and Advancement Assoc., Ltd.
Johannesburg

• *This article appeared in WD&F's April issue and was well received. It pointed out one thing being done to combat the inroads of prestressed concrete in American bridge building.*

COMPLIMENTS

Editor:

I was visiting Buckeye Cellulose Corp. in Foley, Florida, and was impressed by the respect they have for your publication.

I saw a copy of your magazine on the desk of one of Foley's engineers. He told me it was well read in his office.

Bernard W. Downs
General Manager
Weld-Record Corporation
Albany, Georgia

NORpak Control improves performance of complex welding machine

Logic panel provides machine and relay sequencing

David Uihlein, President of Banner Welder, Incorporated, of Milwaukee, Wisconsin, inspects new machine which counts links of chain accurately and quickly, welds on lugs at proper intervals, and cuts chain to correct lengths. Both heat and slope control are furnished.

More accurate lug count — ***NORpak*** eliminates the occasional inaccuracy of conventional relay sequencing and maintains sequence count in the event of machine stoppage.

Faster operation — ***NORpak*** units can operate at switching rates of 25,000 per second. Delays due to control sequencing are eliminated.

Reduced maintenance — Transistorized ***NORpak*** units have no moving parts to wear, are encapsulated in epoxy resin for protection from atmosphere and physical damage.

Simplified circuits — Complete welding and machine sequence is controlled by standard ***NORpak*** components.

GET THE COMPLETE NORpak STORY...

Write for details on the ***NORpak*** *control system as well as* ***NORpak*** *welder control. Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.*

SQUARE D COMPANY

wherever electricity is distributed and controlled

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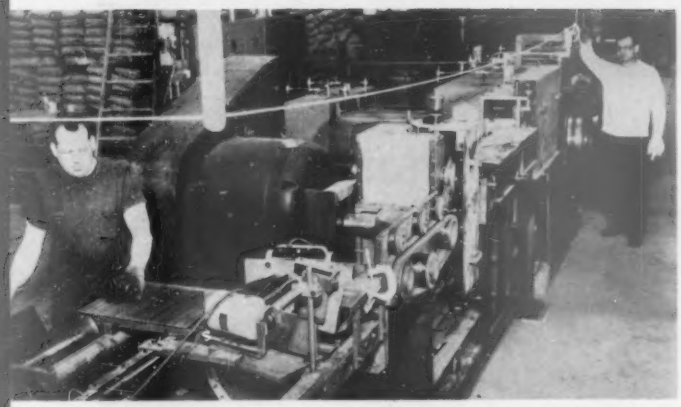
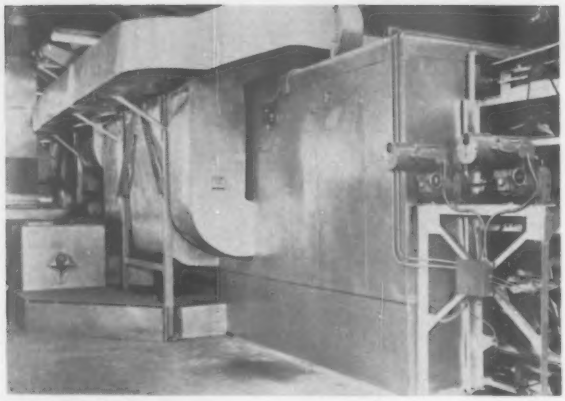


CUSTOM-BUILT equipment mechanically descales, draws, straightens, and cuts hot-rolled rod in one continuous operation.



NEW OVEN has temperature range from 200 to 1000°F and can maintain pre-set oven heats to with 10°F for precision control.

A. O. Smith steps up eastern electrode production

LEOLA, PA. The continuing importance of manual arc welding in modern metalworking was underscored here recently as A. O. Smith Corporation completed a $1/4$-million program to modernize its local electrode plant.

The program was undertaken to meet the expanding needs of eastern and southeastern electrode markets. Spokesmen for the firm's Welding Products Division said that Leola's new manufacturing facilities have:

- Increased plant capacity to over 500 types and sizes of electrodes, and doubled former production. A second shift has been added.
- Accelerated wire draw operation to speeds in excess of 1200 fpm—"faster than any comparable electrode manufacturing facility," according to J. W. Beitenmiller, plant manager.
- Improved end-product quality with a new method of insuring absolute straightness in cut-to-length core wire for each electrode. The straight wire improves electrode concentricity when coating is applied. Concentricity, in turn, means an evenly burning electrode.

Primarily responsible for these efficiencies are a new high-temperature electrode bake oven, functionally integrated with the lower temperature oven that formerly baked the plant's entire electrode output; and new wire drawing, straightening, and cutting equipment, designed to meet the quality and speed requirements of the unique application.

The new propane gas-fired oven bakes 12,000 pounds of electrodes an hour at temperatures up to 1000°F. While present day electrodes, even the low hydrogen and iron powder types, do not require this great a heat, the higher temperatures were built into the facility to meet future needs.

Another factor in the Leola plant's increased efficiency is a custom- designed draw bench that produces electrode core wire faster than 1200 fpm. In a continuous operation, the machine mechanically descales, draws, straightens, and cuts hot-rolled rod to pre-set diameter and length requirements of a specific electrodes. Most comparable facilities, say A. O. Smith spokesmen, draw in one operation and straighten and cut in another.

NEWS BRIEFS

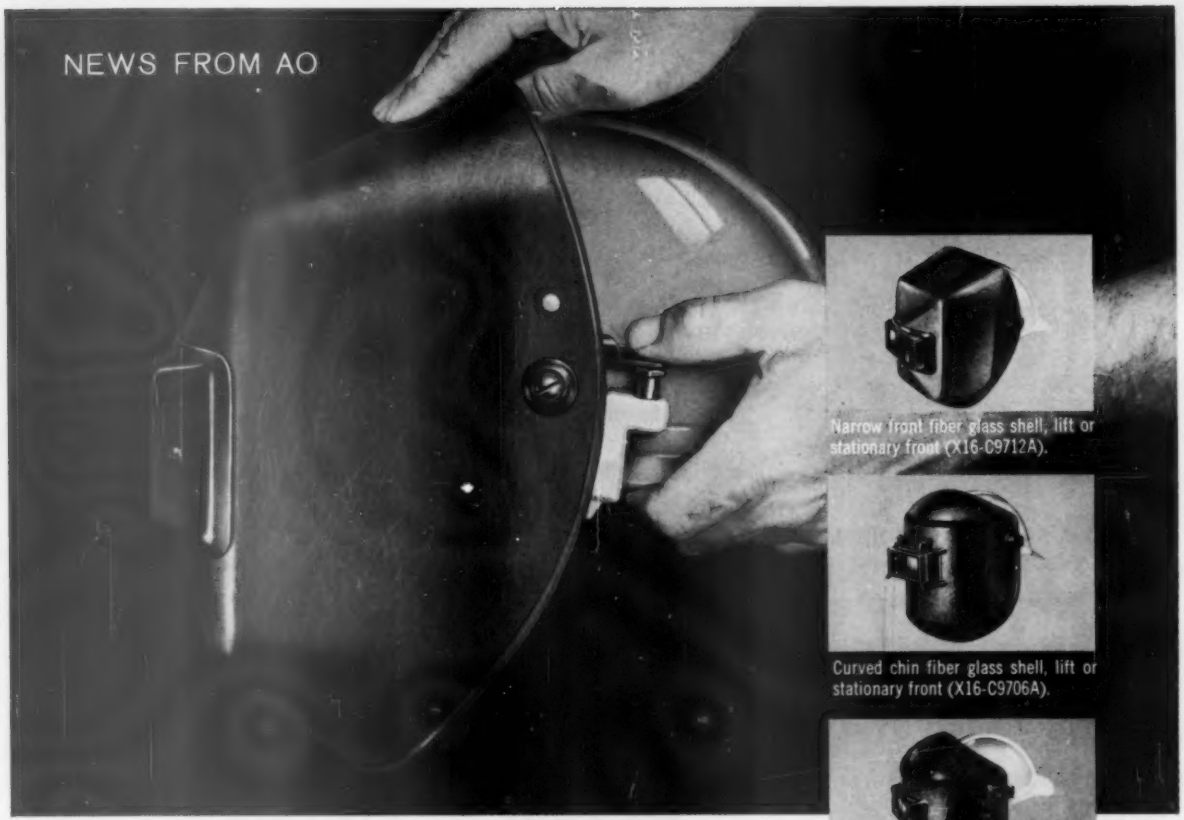
A TRAINING SEMINAR for 12 of its representatives from Canada, Mexico, South America, and the United States was held recently by Harris Calorific Co., Cleveland. The men saw demonstrations of welding and cutting in Harris' new and larger laboratory and did actual welding and cutting themselves.

HOME STUDY COURSE for Canadian welding operators is being offered by the Canadian Welding Bureau. Get details from the Canadian Welding Bureau at 1393 Yonge Street, Toronto 7, Ontario.

METAL JOINING SYMPOSIUM is being held on December 11-13 by Pennsylvania State University. Welding and brazing of high-strength and high-temperature materials will be discussed by five speakers. Get details from Conference Center, Pennsylvania State University, University Park, Pa.

more news on page 12

NEWS FROM AO



Narrow front fiber glass shell, lift or stationary front (X16-C9712A).

Curved chin fiber glass shell, lift or stationary front (X16-C9706A).

Curved chin fiber glass shell, heat-reflective coating, lift or stationary front (X16-C9702WA).

Now... One Easy-to-Use Clip Fastens Any of These Attachments To an AO Safety Cap

You can use any of these accessories with regular AO Dura-Guard safety caps . . . all you need is a pair of AO's simple X30 clip-on attachment holders. Molded of nylon, they slide easily over the side brim and are secured by nylon set screws which hold them tight. No drilling. No holes. No need to stock caps with attachments. Just apply clips to regular stock of caps.

Choose from 10 welding helmet models (both fiber glass and vulcanized fiber, lift or stationary fronts), flexible mask welding goggles, and welders' and chippers' coverglas goggles. All are quickly and simply attached to the Dura-Guard safety cap by slipping the attachment post into the hole provided. It locks securely into position, can be detached in seconds when you want to remove it.

Because they are all-plastic, the X30 clips insulate metal attachment parts, help retain the Dura-Guard cap's dielectric properties. You can get complete details on all these new accessory helmets and goggles by contacting your AO Safety Products Representative or writing direct.

Straight front fiber glass shell, lift or stationary front (X16-C9602A).

Flexible mask with stationary welding plate (X16-C488).

Welders' coverglas goggles (X16-C329B).

Your Surest Protection . . . AO SURE-GUARD Products

American Optical COMPANY

SAFETY PRODUCTS DIVISION • SOUTHBRIDGE, MASSACHUSETTS

For More Information Circle No. 8 on Reader Service Card.

REPAIR and REBUILD
WORN BUCKET PARTS
THIS ECONOMICAL WAY

● Manganal has the greatest toughness, with work-hardened abrasion resistance, of any steel. Protects profits by keeping equipment producing longer . . . with less cost than new parts.

WORN HEAVY-DUTY EQUIPMENT PARTS REQUIRE . . .
HEAVY-DUTY
MANGANAL®
11¾-13½% MANGANESE-NICKEL STEEL
ABSORBS IMPACT AND ABRASIVE WEAR LONGER THAN NEW PARTS

BUCKET DOOR-flame cut from Manganal Hot Rolled Plate.
BUCKET DOOR LATCH PIN — cut from Manganal Square Bar.
BUCKET DOOR LATCH PIN BRACKETS — form from Manganal Flat Bars.
BUCKET SIDES — cut from Manganal Flat Bars.
BUCKET CUTTING EDGE FOR WORN LIP — bend from Manganal Hot Rolled Wedge Bar.
BUCKET TOOTH SOCKETS—reinforce with Manganal Round Bars.
BUCKET CUTTING EDGES BETWEEN TEETH — cut from Manganal Hot Rolled Wedge Bars.
BUCKET FLOOR LINER — flame cut and bend from Manganal Hot Rolled Plate.
BUCKET HITCH PINS & HINGE PINS — cut from Manganal Round Bars.
CRACKED BUCKET LIP—repair with Manganal Electrodes for extra strength.
BUCKET HEEL — reinforce with Manganal Flat Bars.
BUCKET TAPERED LIP—form from various thicknesses of Manganal Round Bars.
BUCKET TEETH — repoint with Manganal Wedge Bars.

Available from all welding distributors.
Nearest Distributor Upon Request. Send for Helpful Literature.
MEMBER NATIONAL WELDING SUPPLY ASSOCIATION
STULZ-SICKLES CO.
929 Julia Street • Elizabeth, New Jersey

For More Information Circle No. 70 on Reader Service Card.

Lincoln Awards $10,000 to Engineering Students

CLEVELAND, OHIO: The James F. Lincoln Arc Welding Foundation has granted awards to 53 engineering undergraduate students for their entries in the Foundation's annual "Engineering Undergraduate Award Program for Arc Welded Designs of Machines or Structures." Awards totaling $10,000 were distributed.

Roland W. Gerstenberger, University of Miami, Florida, led the Machinery Division with a "Design Study of a Welded Engine Block." James M. O'Neal, Rensselaer Polytechnic Institute, led the Structural Division with his design study of "An All Welded, Prefabricated Space Frame."

Each received $1500 first prize.

COMING EVENTS

November 16: National Electric Manufacturers Association Meeting, Plaza Hotel, New York City.

November 27-28: N.W.S.A. Southeastern Zone Meeting, Dinkler-Plaza, Atlanta

November 30-December 1: N.W.S.A. Southwestern Zone Meeting, Sheraton-Dallas, Dallas

December 4-5: Conference on Beryllium Metallurgy, New York University's Washington Square Center, New York City

December 11-13: Metal Joining Symposium, Pennsylvania State University, University Park, Pa.

January 22-25, 1962: Plant Engineering and Maintenance Show and Conference, Convention Hall, Philadelphia

Erie Strayer Opens San Francisco Office

ERIE, PENNA.: Erie Strayer Company has opened new Western manufacturing and sales offices at 650 Fifth Street, San Francisco. It also has developed manufacturing sources for some of its equipment in the West that will result in faster delivery and greater freight savings for their customers. Western Machinery Co., Sacramento, is one of these sources which will produce part of Erie Strayer's mobile and stationary batching and central mix concrete plants and materials handling equipment.

The company recently opened a Special Products Division for the design and fabrication of weldments on a contract basis.

more news on page 79

It's easy on the welder
It's flexible . . it's tough

Yes, Belden Welding Cable is "easy on the welder." It's engineered and manufactured to be extremely pliable, limp and flexible. Result: more production . . better quality . . lower costs.

And Belden Welding Cable is rugged . . rough and ready for the most severe conditions of abrasion, impact, as well as exposure to heat, cold, and oil.

Belden has a welding cable engineered for every possible welding requirement . . Oil Tempered Rubber Jacketed . . Neoprene Jacketed . . HVF Vinyl Plastic Jacketed . . Whip Lead, Super-flexible and Neoprene Jacketed . . Neocote colors for identification . . Rubber Jacketed Welder Supply Cords.

ORDER FROM YOUR WELDING SUPPLY DISTRIBUTOR

Belden Welding Cable comes in many ready-to-use package lengths.

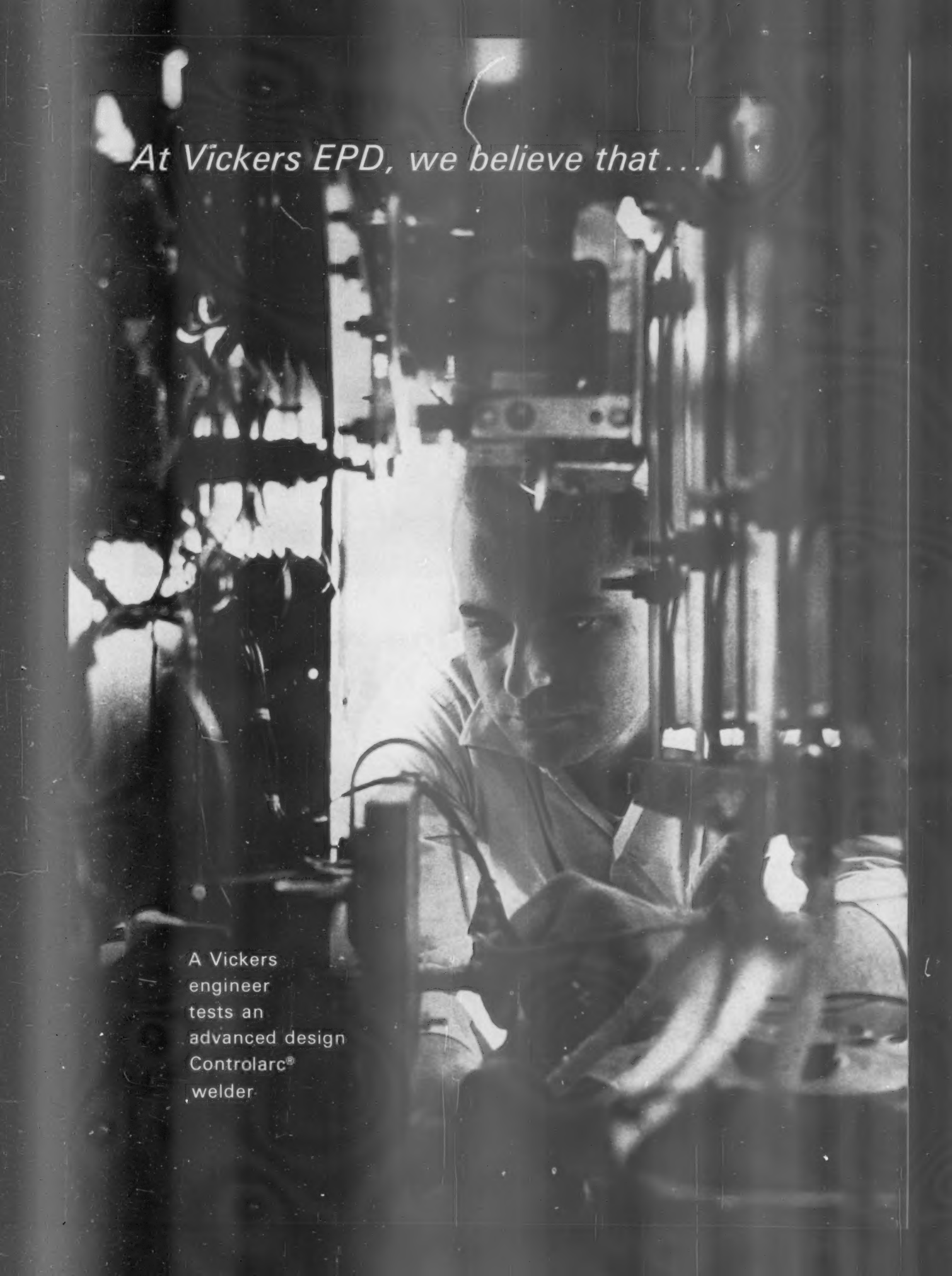
Welding Cable by Belden

WIREMAKER FOR INDUSTRY
SINCE 1902
CHICAGO

one wire source for everything electrical and electronic

magnet wire • lead wire • power supply cords • cord sets • portable cordage • electronic wire • control cables • automotive replacement wire and cable • aircraft wire

18-1-0



At Vickers EPD, we believe that . . .

A Vickers engineer tests an advanced design Controlarc® welder

IT TAKES MORE THAN PARTS TO BUILD A WELDER

It also takes imagination. And nerve. The imagination to conceive of new directions, new departures in welders and welding systems. The nerve to act on these concepts.

Sure, we at Vickers get ready to build welders in much the same way as everybody else. With a good knowledge of the problems that you have in your plant. With a full complement of good production people. With all the tools and machines necessary. And with a stockpile of parts, most of which we fabricate ourselves so we can control workmanship and quality.

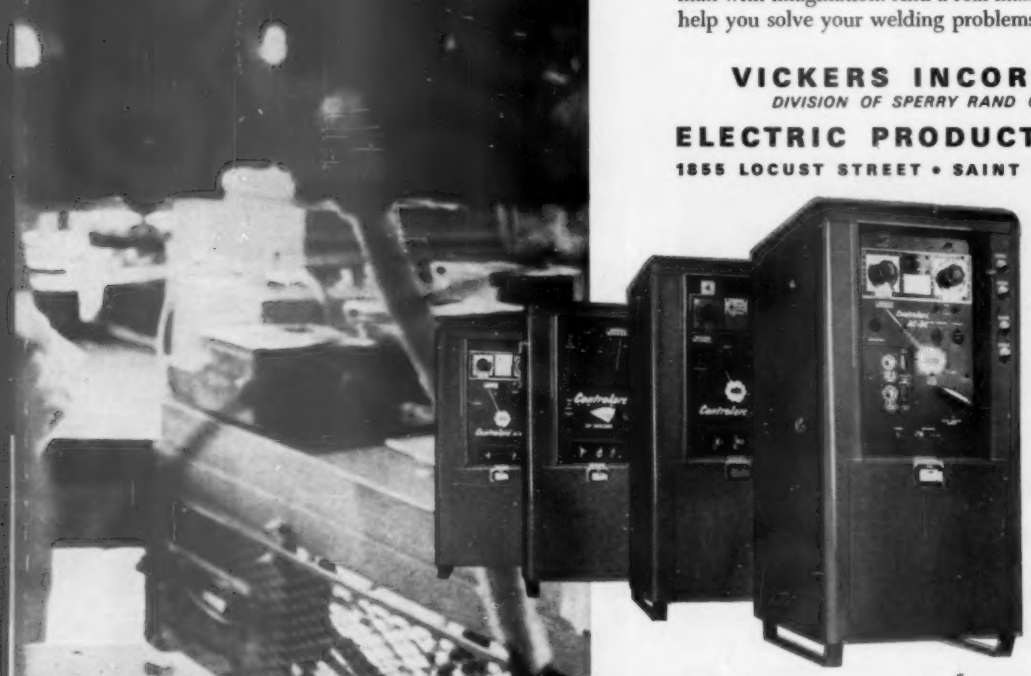
But it's when we go to work that the *difference that is Vickers* creeps in. For we work from plans that have been developed by Vickers welding engineers . . . specialists with imagination. Men who have a way of being dissatisfied with the status-quo. Guys who are determined to find a better way to do things. And this imagination, this determination, pays off on your production lines.

It pays off with such industry firsts as the Vickers Program Controller . . . the heart of a Vickers Controlarc® welding system. With the Program Controller, you're provided with automatic current build-up at the beginning of weld and current taper at end of weld. With it in your Controlarc system, you're guaranteed quality weldments.

It pays off, too, in a complete line of Controlarc standard magnetic-amplifier welders in a range from 200 to 1500 amperes, and a full group of accessories to fit all your DC or AC/DC welding requirements. From heavy plate to thinnest alloys, for carbon steel or rare metal, Vickers has the machine, or can build the system, you need.

Why not get the whole story of Vickers quality welding equipment from your Vickers welding dealer? He's also a man with imagination. And a real man of parts who can help you solve your welding problems.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
ELECTRIC PRODUCTS DIVISION
1855 LOCUST STREET • SAINT LOUIS 3, MISSOURI



Vickers Controlarc® magnetic-amplifier welders are rugged and reliable... work without interruption. Flexible, versatile, they do an outstanding job across the board, and are especially suited to precision automatic or semi-automatic welding demanded by modern industry.

CONTROLARCS® / STANDARD • CONSTANT POTENTIAL
shown from left to right / MIG-TIG • AC-DC

VE71-1

Circle No. 73 on Reader Service Card.

WELDING MANAGEMENT

watches these developments

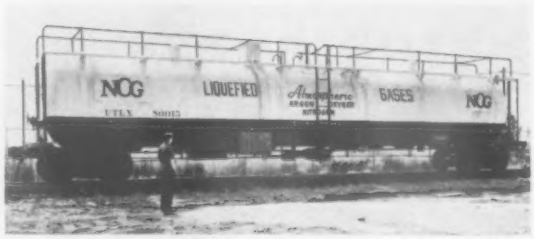
U. S. TRADE WITH JAPAN (in millions of dollars)			
Year	Exports	Imports	Export Balance
1956	887	548	+339
1957	1,227	602	+625
1958	829	674	+155
1959	931	1,018	− 87
1960	1,325	1,127	+198

U. S. TRADE WITH JAPAN is analyzed in a report published by the United States-Japan Trade Council, Inc. The report shows that trade has grown from a level of $1.4-billion, both ways, to $2.5-billion during the last five years. This country has had a consistently favorable trade balance with Japan in every postwar year except 1959.

The most remarkable gain in exports between 1956 and 1960 was achieved by metalworking machinery, which rose from $7-million to $61-million.

MEMBERS of the Resistance Welder Manufacturers' Association report shipments of more than $2½-million during July. This was the fifth consecutive month that shipments have been substantially in excess of $2-million. For the first 7 months of 1961, shipments total almost $17-million, which is just 6 percent under the comparable period in 1960. New orders received during July were the highest for any month thus far.

PLASMA ARC CUTTING is being used by Joseph T. Ryerson & Son, Inc., Chicago metals distributor, for cutting stainless steel plate. Ryerson reports stainless plates 3/16- to 2 1/2-inches-thick can be cut to simple or intricate shape with quality of cut equal to or superior to that obtained with other methods. They say the plasma arc equipment furnished by Thermal Dynamics Corp. may also be used to cut aluminum and carbon steel.



CRYOGENIC CARRIER, one of five put in service by the NCG Division of Chemetron Corp., is 65 feet long. Its capacity of 15,000 gallons makes it the largest in this country for carrying liquid oxygen, nitrogen, or argon; vacuum insulation makes possible moving of the gases at as low as minus 320°F without loss, NCG officials report.

THE WEST'S FIRST INSTALLATION of a Hamilton Zeiss electron beamwelding machine has been announced by Airtite Products, Division of the Electrada Corp., Los Angeles. Airtite will use the machine for production work and experimenting.

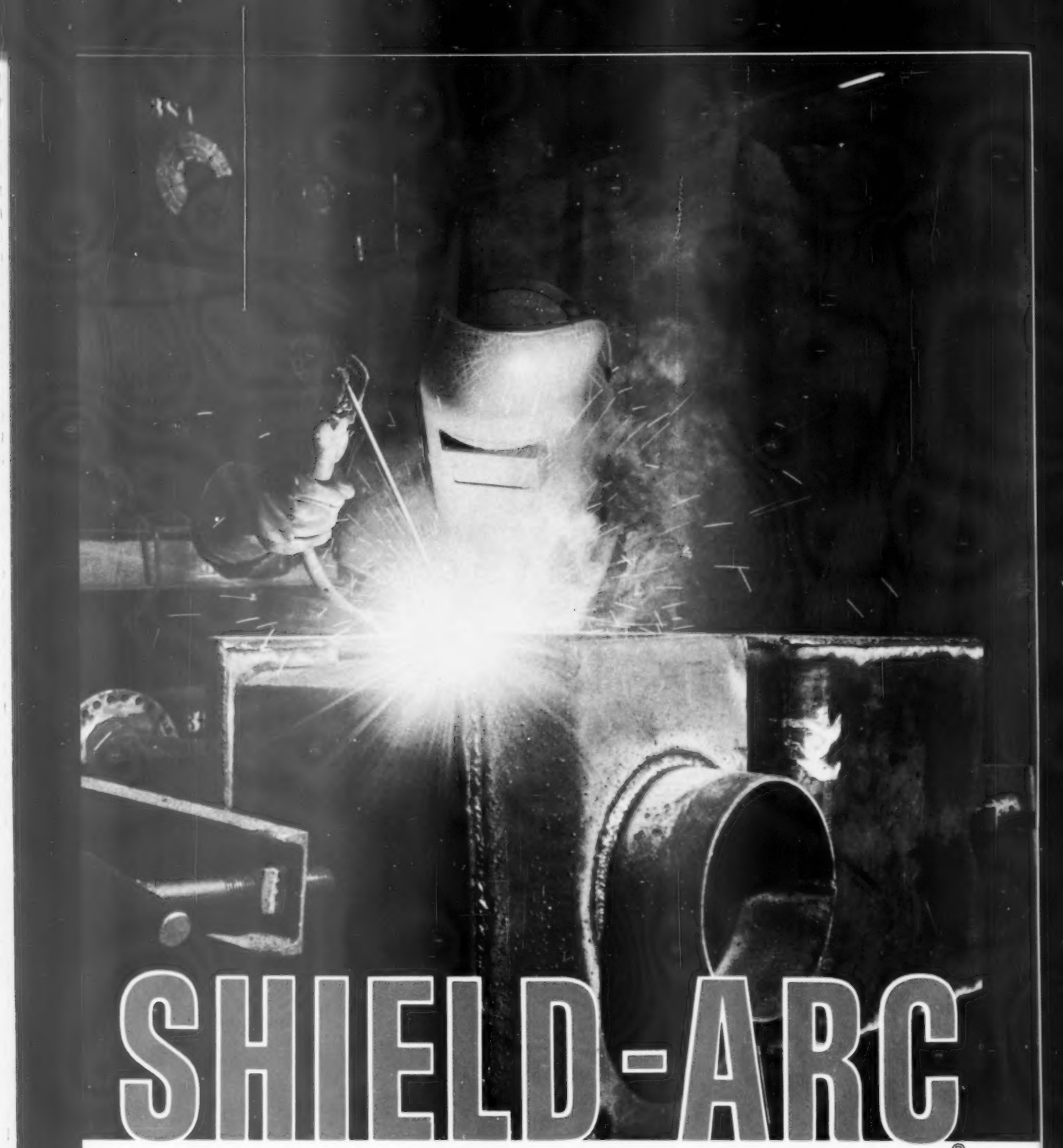
	Percentage changes in dollar sales *						
ZONES	1	2	3	4	5	6	Gen. Avg.
Sales – second quarter, 1961 compared to second quarter, 1960	4%	-1%	1%	8%	6%	4%	6%
Sales – first six months, 1961 vs first six months 1960	2%	0	-3%	9%	5%	5%	4%
Number reporting	40	20	36	31	22	33	182

* Percentages are plus unless preceded by a minus sign.

WELDING SUPPLY SALES were up 6 percent for the second quarter of 1961 over the same period in 1960. That's the report from 182 distributor members of the National Welding Supply Association. They also reported that sales for the first 6 months of 1961 were up 4 percent over the first 6 months of 1960. Here are the figures:

Zones are: No. 1, Eastern; No. 2 Southeastern; No. 3, Central; No. 4, West Central; No. 5, Southwestern; No. 6, Western.

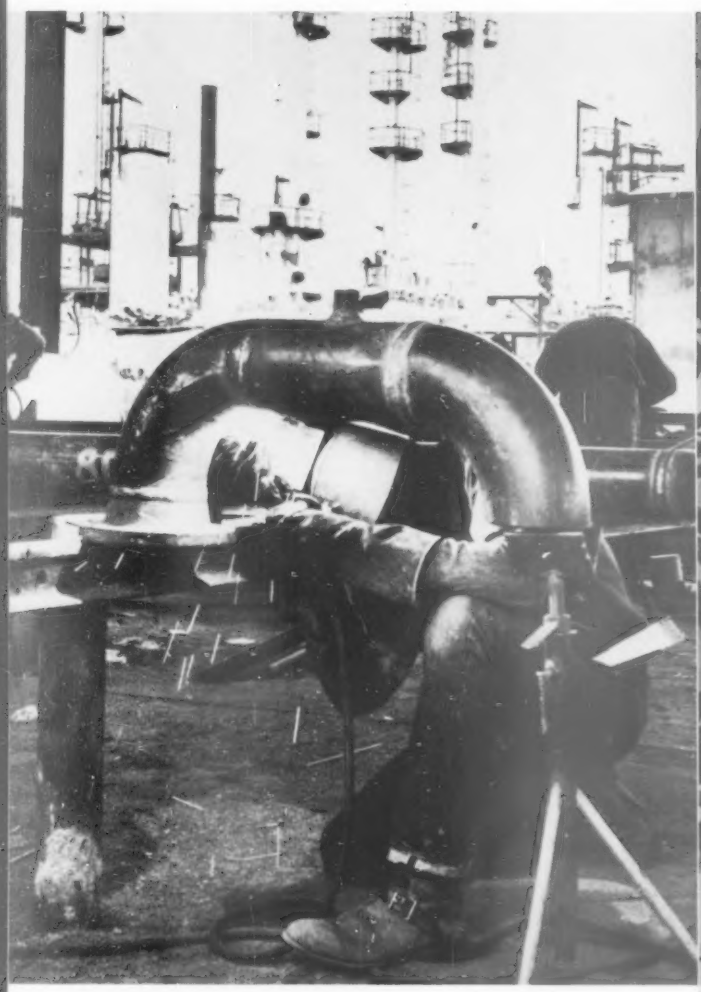
Circle No. 47 on Reader Service Card. ⟶



SHIELD-ARC®

Lincoln **Shield-Arc** motor-generator welders are preferred 3 to 1 over any other kind of arc welder made. Why? Because through the years they have proved reliable, versatile and capable of producing consistently top-quality welds on all kinds of work — from heavy production to routine maintenance. On the following pages, we propose to substantiate these claims.

This is SHIELD-ARC on the job



Here, a **Shield-Arc** is used on a pipe fabricating job. But, any maintenance job which can be performed by manual welding can be performed best with these machines. Their wide range of currents lets you handle sheet one minute, heavy plate the next, stainless steel the next. In every case you'll get easy, fast welding backed by a rugged, dependable machine.

Whether you use **Shield-Arc** motor-generators in the shop or **Shield-Arc** engine welders on outdoor construction work like this, you'll find their design adds to the versatility of manual welding by making every job go easier, faster. And, their use of conservative, oversize components lets you turn out more work, longer, without danger of burning up the machine. These are beefy machines for the really big, tough welding chores.

How can you prove the reliability of any machine? You can't with words, really. But you can look at the record. And the record for consistent, trouble-free performance for **Shield-Arc** seems impressive. Over 400,000 **Shield-Arc** motor-generator sets have been sold and better than 60,000 of them are over 20 years old. A surprising number of them are still going strong today. And, in spite of the many new processes available today, **Shield-Arc's** continue to be in ever greater demand.

Versatility? Dual Continuous Controls let the weldor pick from literally thousands of possible combinations—the precise heat and voltage to suit both his style as well as the necessary arc type and intensity demanded by the job. These controls eliminate the need for compromise settings, assure best results, highest quality . . . and ultimately, the most profits for you. Moreover, each size machine offers a wide current range . . . lets you switch from one kind of job to another . . . quickly. If the weld site is distant from the machine, a remote control device can be installed to let the operator alter the current settings from the point where he's working.

LINCOLN WELDERS

Frequently, with transformer-type machines, output current varies due to changing loads on the line. This can result in inconsistent, poor quality welds. Because **Shield-Arc's** are motor-generator machines, and are unaffected by line voltage variations, you simply don't have this problem. You get the same consistent results all day long, day after day, regardless of the number of machines tied into the line.

All Lincoln welders are built with generous, oversize components. **Shield-Arc's** even more so. This means you can run these babies longer and harder than most other types, even do heavy-duty jobs such as Arcair gouging which often overheats and burns up lesser machines.

It's likely that your shop has one or more **Shield-Arc's** in operation now. You know from experience how they perform. But, if you do not, and if you want all these things from your welders . . . dependability, versatility, performance . . . don't take our word for it. Investigate for yourself the benefits offered by **Shield-Arc's** . . . today.

Why do you see more **Shield-Arc's** employed in heavy-duty, continuous production work like this? It's simple. These machines are designed—both electrically and mechanically—to continue to deliver heat at top efficiency as long as it's needed. Each component—from the generously oversized copper windings to the extra-large shaft and heavy-duty ball bearings—all combine to minimize the possibility of downtime, lost profits.

Shield-Arc's Dual Continuous Controls let the weldor select precisely the settings of current and voltage which suit both his style and what his experience tells him is best arc type and intensity for each kind of job. Thus, with a **Shield-Arc**, the weldor can produce the highest quality welds at lowest possible cost. These, of course, translate into higher profits for you.

Pick from several SHIELD-ARC models

Machine pictured is motor-generator model. Shield-Arc DC generators are available with AC motors, DC motors, gasoline engines, diesel engines, and as bare generators for belt driving. All are NEMA rated at 60% duty cycle, 40 volts. These are current ranges for the various sizes. Several types of running gear available.

Machine	Output Current Range Amps
SAE 200	40-300
SAE 300	60-450
SAE 400	80-600
SAE 600	120-750

WANT MORE INFORMATION ABOUT SHIELD-ARC's? See your local Lincoln field sales engineer . . . a specialist in welding. He'll help you pick the right machine for your job. Or, if you prefer, simply write direct to the factory for specification bulletins. All specifications, construction details and optional accessories are shown, described. Why wait? If you weld manually, check into the benefits Shield-Arc's can bring to you now.

THE LINCOLN ELECTRIC COMPANY

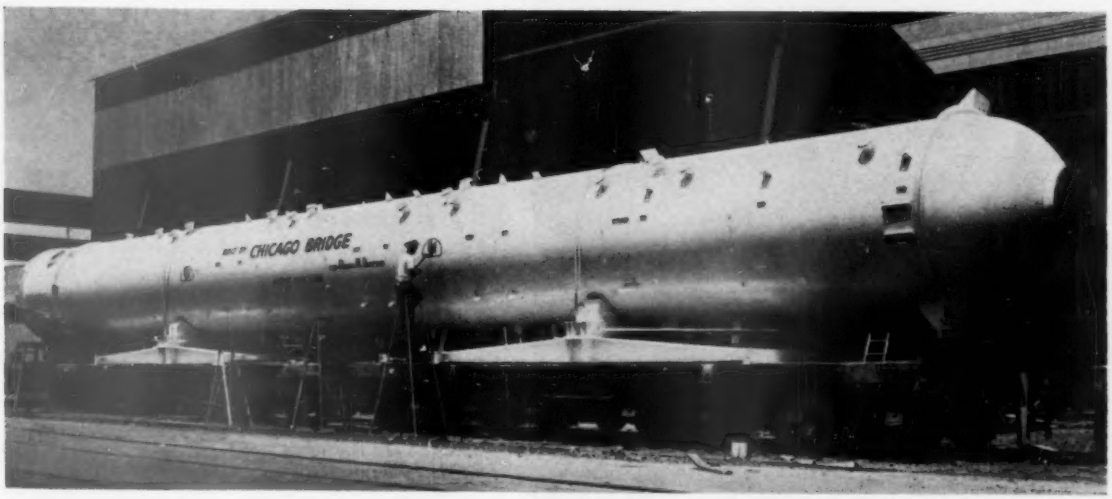
Department WW-191 • Cleveland 17, Ohio

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT AND ELECTRODES

LINCOLN ...USA

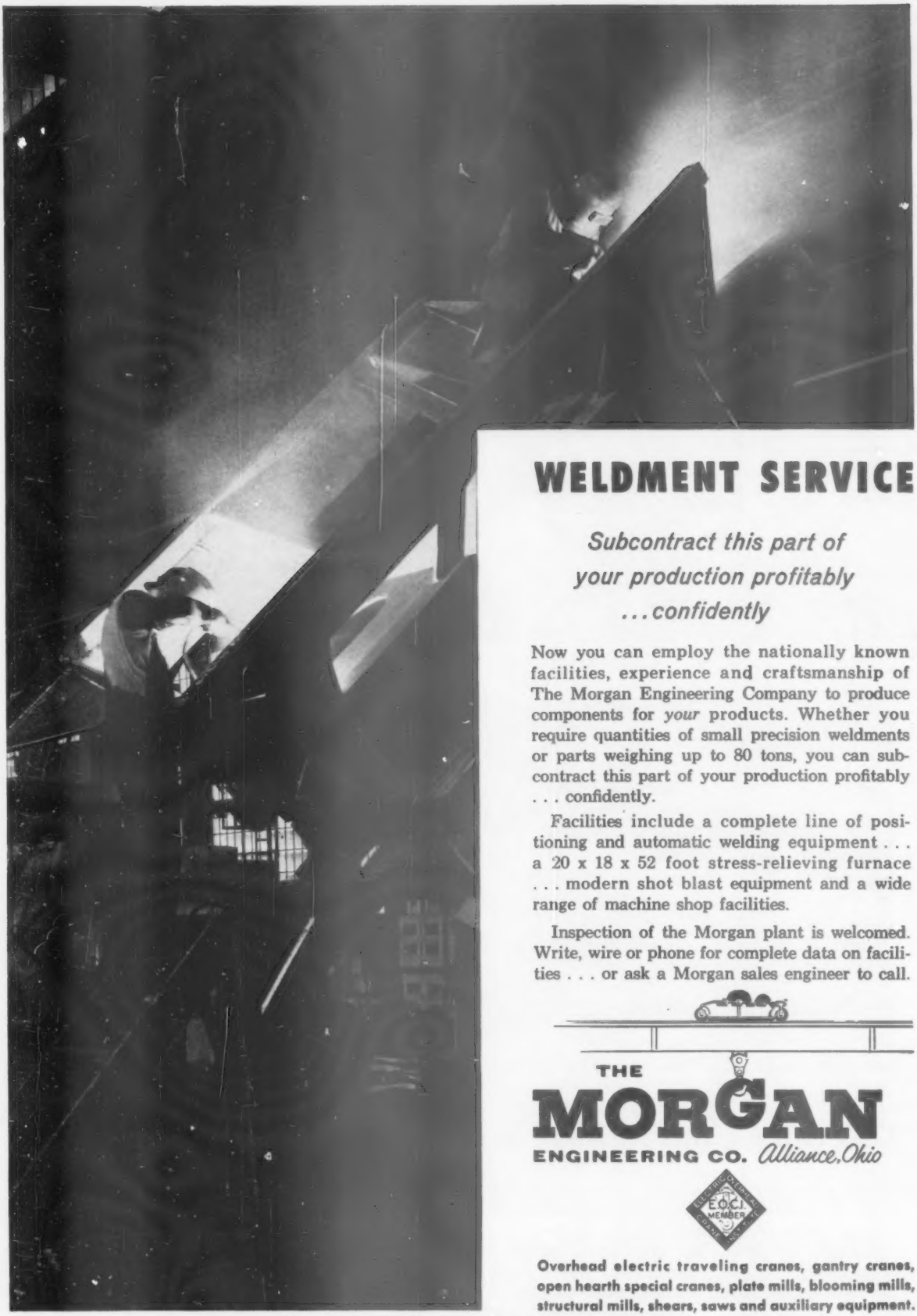
Cranes position 70-ton leaf for downhand welding

NEVILLE ISLAND, PA.: Two heavy-duty shipyard cranes and a hoisting beam are required to handle this 70-ton leaf for a river navigation lock miter gate under construction here at Dravo Corporation's yard. Four such leaves are being fabricated for the upper gates of the $15-million Maxwell Locks, which Dravo is building for the Army Corps of Engineers above Brownsville, Pa., on the Monongahela River. Each unit, consisting of structural members covered with a skin plate on one side, is turned by the cranes to allow downhand welding at all times. When complete, the leaves each will be cut in half, shipped to the lock site in two sections, then welded together again.



CBI ships giant refinery tower on two flat cars

BIRMINGHAM: Giant refinery tower that weighs 400 tons and is more than 100 feet long gets final touch of paint before moving from Chicago Bridge & Iron Company's fabricating plants here. Even distribution of its immense weight required 2 heavy-duty, 8-axle rail flat cars and special bolsters capable of supporting 500-tons. The 8-foot-diameter vessel was made from 7-inch-thick chrome-molybdenum steel plate (SA-387B firebox). It is designed for a working pressure of 1,760 psi at 800°F. It was ordered by Ralph M. Parsons Company for iso-cracking service at Standard Oil Company of Ohio's Toledo refinery.



WELDMENT SERVICE

Subcontract this part of your production profitably ...confidently

Now you can employ the nationally known facilities, experience and craftsmanship of The Morgan Engineering Company to produce components for *your* products. Whether you require quantities of small precision weldments or parts weighing up to 80 tons, you can subcontract this part of your production profitably . . . confidently.

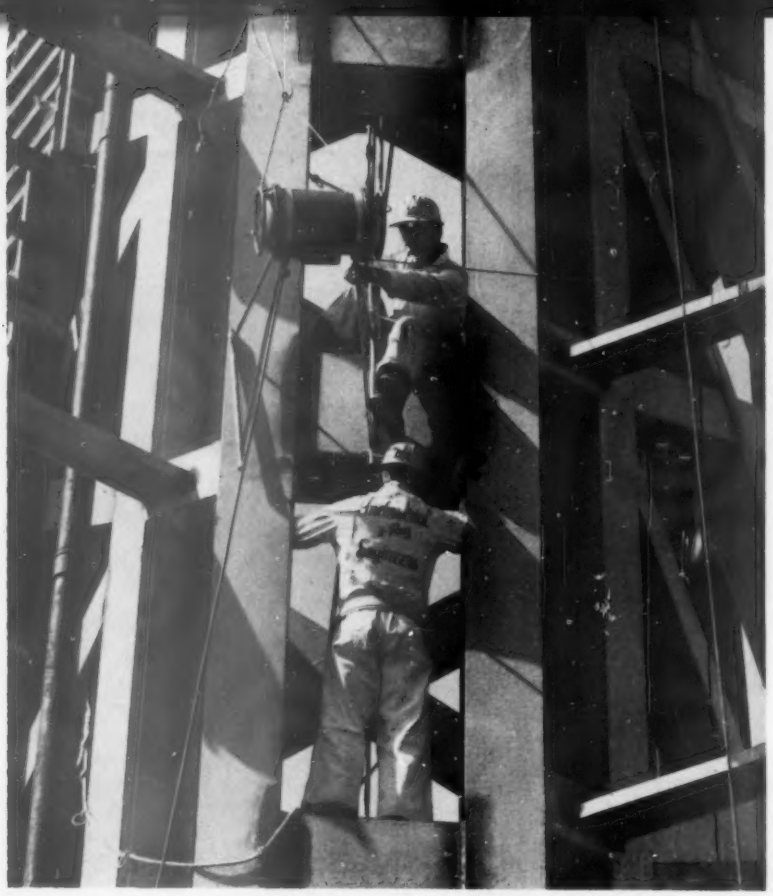
Facilities include a complete line of positioning and automatic welding equipment . . . a 20 x 18 x 52 foot stress-relieving furnace . . . modern shot blast equipment and a wide range of machine shop facilities.

Inspection of the Morgan plant is welcomed. Write, wire or phone for complete data on facilities . . . or ask a Morgan sales engineer to call.

THE
MORGAN
ENGINEERING CO. *Alliance, Ohio*

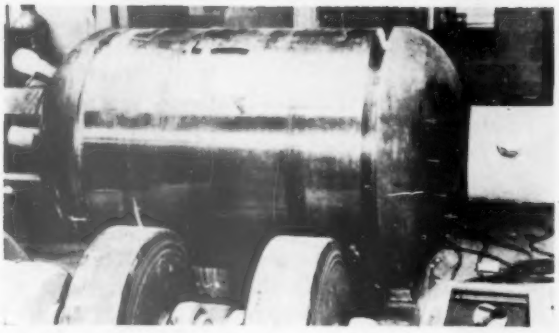
Overhead electric traveling cranes, gantry cranes, open hearth special cranes, plate mills, blooming mills, structural mills, shears, saws and auxiliary equipment.

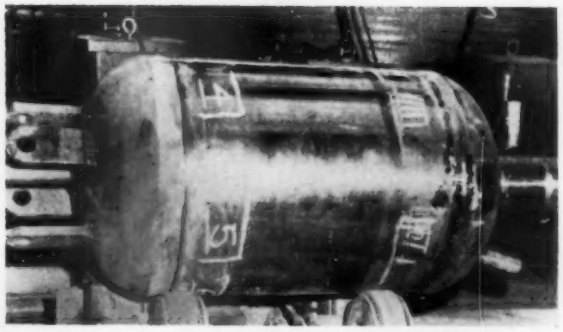
For More Information Circle No. 54 on Reader Service Card.



Radiography checks welds in Space Needle

SEATTLE, WASHINGTON: Technicians of Industrial X-Ray Engineers position their X-ray unit to radiogarph welds on the center core section of the Century 21 Space Needle being built here for the Seattle World's Fair. All critical welds on the 600-foot structure are being inspected radiographically to assure soundness. These men are on box girders at the 75-foot-level.





ROOT PASSES made with EB Weld Insert process (left) join cover and bottom sections to demineralizer's shell. Joints are completed (right) by submerged welding.

Nuclear destroyer has welded stainless demineralizer

CAMBRIDGE, MASS.: Difficult welding jobs are encountered by shipyards and their subcontractors in this era of nuclear-powered ships. Because sound welds are essential, carefully planned welding procedures and the best welding materials must be used.

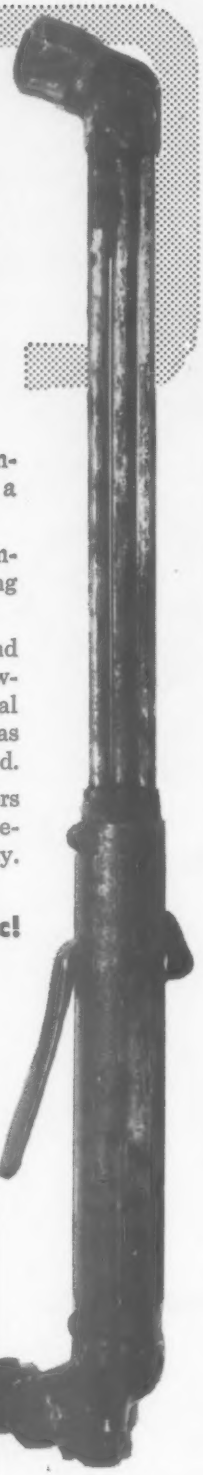
An example of what can be done is a prototype 8-ton, all-stainless steel (Type 304) demineralizer made by Avery & Saul Co. for a U. S. Navy nuclear-powered destroyer's primary system. It has a 24-inch-diameter, is 7-feet-high, and has a 2-inch wall.

Avery & Saul used three different welding processes to fabricate the demineralizer: manual, submerged arc, and the Arcos EB Weld Insert process. By using the latter process for the root pass in joining the cover and bottom sections to the shell, Avery & Saul reduced welding time considerably, getting a full penetration root pass while welding from one side only. The EB Weld Insert process uses a preplaced weld insert which is completely fused, using a conventional tungsten arc torch.

The Tig process was also used for the first few passes, with Chromenar K-LC filler wire. To complete the joints, Avery & Saul used the submerged arc process with Chromenar K-LC electrode and Arcosite S-4 flux supplied by Arcos Corp.

280 days in a taconite furnace

(and 85¢ in parts had it cutting again!)



In June, 1960, the torch shown was unintentionally left in a taconite pellet furnace of a processing plant in northern Minnesota.

Temperatures of 1400° to 1500° are maintained in the furnace which is used for drying and curing of taconite pellets.

9 months later, the torch was discovered and removed, in apparently useless condition. However, it was placed in a vat of commercial solvent for half an hour; the valve seat was replaced and two new "o" rings were installed.

It was then connected to a pair of cylinders and it made the same perfect cuts as it did before its hot vacation. No leaks. Full capacity.

Total cost for repair parts . . . 85c!

Your torches may never be subjected to this kind of treatment, but the point is that the torch pictured is built to outperform and outlast the finest — saving down time and repair costs.

Incidentally, Smith's Flat Rate Exchange program would provide a rebuilt, newly guaranteed torch for $16 if extensive repair had been necessary.

The torch is Smith's famous Silver Star SC229. Why not call your Smith distributor for a demonstration?

SMITH'S®

SMITH WELDING EQUIPMENT
DIVISION OF TESCOM CORPORATION
27TH AVE. and FOURTH ST. S. E.
MINNEAPOLIS 14, MINNESOTA

For More Information Circle No. 67 on Reader Service Card.

MEN ON THE MOVE

in the welding industry

PROMOTIONS:

MARTIN

BEASLEY

Metal & Thermit Corp. announced several top management changes. **H. E. Martin** has become chairman and chief executive officer. Replacing him as president is **Charles J. Beasley. H. W. Buchanan** has been named executive vice president. **Leonard W. Mawhinney** has been named a vice president. **R. A. Bernabo** has been elevated to corporate secretary. **E. J. Robesch** has been appointed assistant controller and assistant secretary. **Dr. Alexander Ross** has been appointed European technical representative for M&T Chemicals AG.

Laverne Hallman has been appointed Assistant Controller, Budgets, of Alan Wood Steel Company, Conshohocken, Pa.

Air Reduction Sales Co. announces three promotions. **J. J. Rendos** has been appointed assistant manager of Airco's Cryogenic Engineering Department in Plainfield, N. J. **L. J. MacLennan Jr.** has been made assistant manager of distributor sales in the Midwestern region. **R. B. Calhoun** replaces MacLennon as assistant manager of distributor sales in the Pittsburgh district.

Norton Company makes several promotions. **Samuel M. Hines** has been appointed a grinding wheel sales representative in the Philadelphia area. **William T. Hildick** has been assigned to the Chicago district office as a grinding wheel field specialist. **John G. Kelso** has been appointed manager of Norton Casale S. A. of Mendoza, Argentina.

continued on page 26

warms up "cool" ideas

Close a deal for new, improved refrigerator tank cars and Tungsten Inert Gas Welding will help you hold the profit line. Low-cost, efficient TIG welding pays when you're welding ventilating ductwork, pipelines or hardware for outer space too. And for this kind of work, no finer Tungsten Electrode is made than by Sylvania.

Sylvania offers the most complete line of top-quality Tungsten Electrodes: Puretung®, Zirtung®, 1% Thoriated, 2% Thoriated. Each comes in the preferred finish—cleaned or ground, and color-coded to save you time and prevent costly errors. Chemical & Metallurgical Division, Sylvania Electric Products Inc., Towanda, Pennsylvania.

There's a Sylvania Tungsten Electrode for every welding need.

SYLVANIA

Subsidiary of **GENERAL TELEPHONE & ELECTRONICS**

For More Information Circle No. 71 on Reader Service Card.

Hackney seamless high-pressure cylinders

Hackney seamless cylinders are formed from a single disc or billet so that the bottom is integral with the cylinder walls. There's little chance for leaks. They are ideal for shipping, storing and dispensing oxygen, argon, nitrogen, hydrogen, carbon dioxide, compressed air and many other compressed gases.

And because all Hackney cylinders are made the cold drawn way, surfaces are smooth inside and out, with crevices, hollows and ridges eliminated. Cleaning and painting time is reduced throughout the life of the cylinder.

Manufactured in strict compliance with specifications which exceed ICC requirements, Hackney cylinders are finished to your order as specified. For complete details, ask for a copy of the new Hackney cylinder catalog. It gives up-to-date information for all your cylinder needs. Write for your free copy today.

Pressed Steel Tank Company

Manufacturer of Hackney Products Since 1902

1473 South 66th Street, Milwaukee 14, Wisconsin

Branch offices in principal cities

CONTAINERS AND PRESSURE VESSELS FOR GASES, LIQUIDS AND SOLIDS

For More Information Circle No. 60 on Reader Service Card.

MEN ON THE MOVE

continued from page 24

PROMOTIONS:

Rowland Erving has been appointed Director of Market Research of The McKay Company.

Elmer R. Dysert has been appointed superintendent of the Marietta, Ohio, pipe fabricating shop of Dravo Corp., Pittsburgh.

APPOINTMENTS:

National Cylinder Gas Division of Chemetron Corporation has appointed seven new dealer representatives in six districts: **G. P. Zielke** and **R. J. Eisler,** Chicago; **N. P. D'Alessandro Jr.,** Boston; **H. B. Stormer,** Buffalo; **F. J. Gordon,** Cleveland; **K. W. Clemen,** Philadelphia; and **R. C. Weiss,** St. Paul.

Alvin K. Oros has joined Hobart Brothers Co., Troy, Ohio, as welding engineer.

Edward R. Pierre has been appointed to the Technical Sales Department and **W. D. Oldershaw** to the Technical Service Department of Miller Electric Mfg. Co., Appleton, Wisconsin.

Gary Farrell has been appointed district representative serving North Central Wisconsin and Upper Michigan for Milwaukee Electric Tool Corp. **Rick Haise,** formerly in this area, will service accounts in Southern Wisconsin.

George E. Motzenbecker has been named sales manager for Welding Gas & Equipment Company, distributor for Linde Company, Harnischfeger Corp., and other welding manufacturers in the Detroit, Michigan, area.

The Carborundum Company has appointed three merchandising district sales managers: **Kenneth R. Smith** for the Buffalo-Pittsburgh district; **James H. Jones,** Philadelphia; and **Lenard C. Murphy,** Cleveland-Detroit.

continued on page 28

Why shout?

We don't make fancy claims, just good electrodes. We take great care in making them. We make all kinds, too.

All we ask is that you try a box. We think you'll be pleased with the way they weld. BUT: If they aren't — in your honest opinion — as good or better than any electrode you've used, bring back the box and we'll give you back your money.

Square deal?

HARNISCHFEGER
Milwaukee 46, Wisconsin

P&H
WELDING PRODUCTS DIVISION

Spot Weld Easier with Tuffaloy—For Less!

NEW IDEA!
ALL ALUMINUM SPOT WELDING TIP HOLDER

It took a complete departure from previous manufacturing methods to come up with this low-cost, high quality spot welding tip holder (each is a slice of a giant aluminum extrusion). These TUFFALOY holders are corrosion resistant, carry threaded tip adapters to take the brunt of tip socket wear. For welding pressures to 1000 lbs.

THE TRADEMARKS TO TRUST
AIRCO

NEW IDEA!
PADDLE-TYPE HOLDER
USES NO 'T' CONNECTOR

A new design idea makes this TUFFALOY Holder more rugged, long-lived, and lower in cost to use—no tee connector is needed. Ideal for spot welding in restricted areas. TUFFALOY Socket-Type Tips (four nose types available) may be inserted on either side of the paddle.

Doc Tuffy says . . . be quick to use everything that improves your product or cuts your cost if you want to stay ahead of the pack . . . better get with TUFFALOY; we're coming up with the new ideas in our field.

Write or call your nearest AIRCO or TUFFALOY distributor for more information about these holders. Also request the new TUFFALOY Catalog; it describes the new RW Taper numbering system for spot welding electrodes.

AIRCO

AIR REDUCTION SALES COMPANY
A division of Air Reduction Company, Incorporated
150 East 42nd Street, New York 17, N. Y.

More than 700 Authorized Airco Distributors Coast to Coast

On the west coast: Air Reduction Pacific Company, **Internationally:** Airco Company International, **In Canada:** Air Reduction Canada Limited
ALL ARE DIVISIONS OR SUBSIDIARIES OF AIR REDUCTION COMPANY, INC.
For More Information Circle No. 3 on Reader Service Card.

MEN ON THE MOVE

continued from page 26

ELECTIONS:

The Boards of Directors of Hamilton-Thomas Corporation and two of its subsidiaries, C. H. Wheeler Manufacturing Company, Philadelphia, and The Griscom-Russell Company, Massillon, Ohio, have elected **Donald S. Walker,** formerly a director and vice president of sales of Combustion Engineering, Inc., a director of the three companies.

HONORS:

John M. Johnson of Lake Nebagamon, Wisconsin, won first prize of $746 with this heavy-duty trailer in the industrial arts section of the $15,000 national welding contest for high school boys sponsored annually by the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio.

OVERSEAS:

Robert C. Bercaw is shown here departing from Dayton, Ohio's Cox Municipal Airport on a round-the-world tour for Hobart Brothers Company. He will conduct welding demonstrations and clinics in Essen, Germany; Istanbul and Izmir, Turkey; Karachi and New Delhi, India; Cogema and Saigon, South Viet Nam; Manila, P. I.; Sydney, Australia; and Honolulu, Hawaii.

To users of submerged arc welding equipment

NOW! Reclaim both hardfacing and mild steel fluxes with VICTOR GRINDER

Completely automatic feed on Victor's new model flux grinder eliminates hand loading... removes tramp metal from and reclaims up to 80% of used flux . . . delivers as much as 1200 pounds hourly of re-ground flux, sized to factory specifications.

"Paid for itself in six months," says an owner of our previous model. Not bad, but you'll find this new, improved Model FG 200 even better. Here's why –

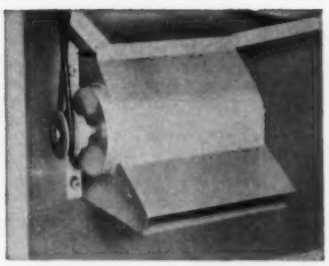
- Boom and electric ¼-ton hoist cut out hand lifting flux buckets.
- Self-loading hopper and conveyor eliminate manual feeding, assure a steadier and larger flow of flux.
- Three magnetic separators (2 more than before) trap and remove 90% or more of spatter and tramp metal.
- You get up to 1200 usable pounds hourly of either hardfacing or mild steel flux, so free of contaminants you can scarcely tell reclaimed from new.

Why pay outsiders 4 to 5¢ a pound to regrind flux and lose half of it in the process, when a Victor improved flux grinder pays for itself? Order from your Victor dealer now. He's your one-stop source for welding and hardfacing supplies.

HOW VICTOR FREES FLUX AND TRAPS METALS

Primary magnetic separator removes most of loose metal as used flux feeds into crusher rolls. Hinged cover lifts for easy cleaning.

Here two hardfaced rollers crush fused flux, thus freeing all metal so second magnetic separator can pick it up as flux flows on.



Final magnetic separator at output spout catches last remaining metal particles. No wonder the Victor makes re-usable such a high percentage of fused and used flux.

VICTOR ing

VICTOR EQUIPMENT COMPANY

844 Folsom Street • San Francisco 7

3821 Santa Fe Avenue, Los Angeles 58 • 1145 E. 76th Street, Chicago 19

Mfrs. of roller and idler rebuilding machines; high pressure and large volume gas regulators; welding & cutting equipment; hardfacing rods; blasting nozzles; cobalt and tungsten castings; straight-line & shape cutting machines

86-R

For More Information Circle No. 74 on Reader Service Card.

600,000 pounds of ATOM·ARC® * helped create a welded waterfall at Niagara

The rushing waters of the Niagara River, diverted through this man made waterfall are energizing one of the world's largest hydroelectric power plants . . . The Niagara Power Project of the New York Power Authority. The project consists of two generating stations, the Niagara Generating Station and the Tuscarora Pump-Generating Station with a combined capacity of 2,190,000 kw.

Chicago Bridge & Iron Company constructed the project's 25 penstocks and also erected the 25 turbine scroll cases. This huge field construction job required in excess of 600,000 pounds of Atom·Arc iron powder low hydrogen electrodes.

Atom·Arc and the *Creative Craftsmanship* of CB&I is a combination that has worked together on many jobs such as this throughout the world, compiling an enviable record of success.

Here are some of the *job proven values* that have helped spell success for CB&I and other discerning fabricators: X-ray sound weld metal . . . excellent impact values . . . outstanding arc characteristics . . . plus a complete line, in strength levels from 70,000 psi to 120,000 psi and in analyses for welding nearly every type of low alloy high tensile steel.

To find out how these *job proven values* of Atom·Arc electrodes fit into your welding needs, send for our 64-page booklet, "Handbook for Welding Low Alloy High Tensile Steels." Write to Alloy Rods Company, Post Office Box 1828, York, Pennsylvania.

ALLOY RODS COMPANY

YORK, PENNSYLVANIA

SALES OFFICES AND WAREHOUSES • BOSTON • NEWARK • PHILADELPHIA • PITTSBURGH • BIRMINGHAM
CHICAGO • CLEVELAND • SAN FRANCISCO • EL SEGUNDO, CAL. • DISTRIBUTORS IN ALL OTHER PRINCIPAL CITIES

Thirteen penstocks, each 28 feet in diameter and 460 feet long, and at the far right, the scroll case installations which make up the Niagara Generating Station.

* **ATOM·ARC®** is the trade name for America's first and foremost iron powder low hydrogen electrode.

For More Information Circle No. 5 on Reader Service Card.

Only Norton brings you these new time-savers!

Dis-Card mounts cut portable wheel changing time from minutes to seconds!

Type BSA, new Cut-N-Saucer shape with new Dis-Card mount.

Type BD, straight, with knurled sides and new Dis-Card mount.

Type BDA, straight, with new Dis-Card mount.

Now you can mount three types of Norton reinforced wheels — BSA, BD and BDA — on portable grinders without a single wrestling match!

As on the new Type BSA Cut-N-Saucer wheels, Norton now adds Dis-Card mounts to Types BD and BDA — long the most popular wheels for blending, cleaning and other everyday welding-shop jobs.

The new Dis-Card mount is a big improvement over ordinary mounts. It's attached to each wheel, *permanently*. Which means you can change wheels in seconds — because there's no "lock washer" action. Every Norton wheel with a Dis-Card mount is already mounted — and *stays* mounted until you throw both wheel and mount away.

Yet you pay no more for Norton reinforced wheels with Dis-Card mounts than for ordinary wheels.

Final cost is less, in fact, because these wheels are engineered to last longer, cut faster and do more work. And don't forget that Cut-N-Saucer wheels have another advantage. They can be held at angles much closer to the horizontal, for easier control and less operator-fatigue.

For further facts on these new time-and-money saving wheels, see your Norton Distributor, or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

NORTON
ABRASIVES

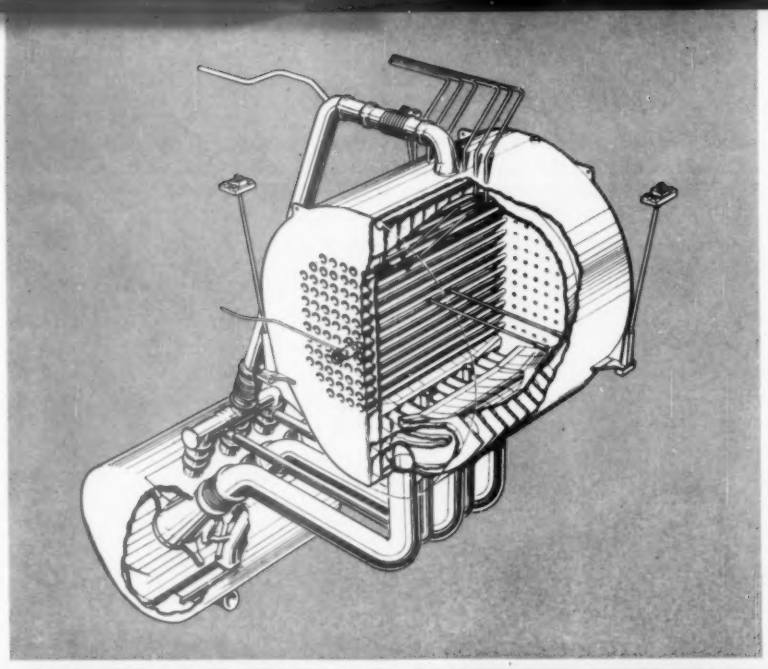
W-2031

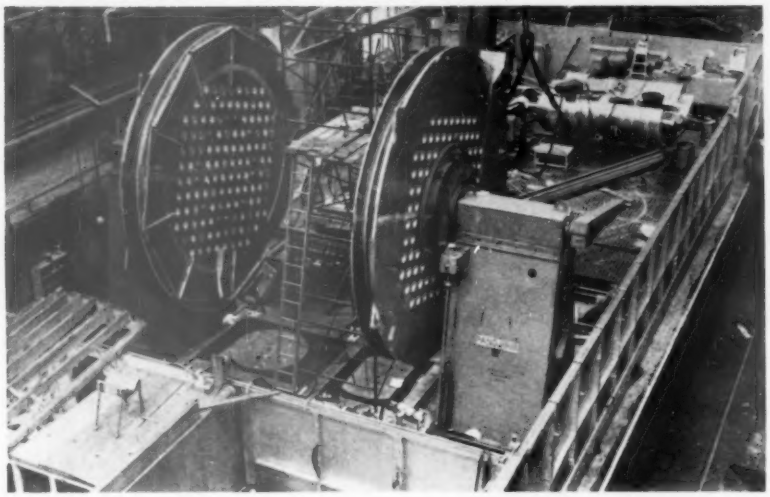
Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Non-Slip Floors — **BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

For More Information Circle No. 56 on Reader Service Card.

NOVEMBER 1961 Welding Design & Fabrication





CALANDRIA REACTOR and moderator dump tank are shown as they will appear when installed in their vaults (top, left). End wall assemblies are mounted on positioner (left) for joining to shell. Later, reflector end tubes are welded through the outer end wall (above).

Welding Canada's natural uranium reactor

IN BRIEF: The reactor core for Canada's first natural uranium reactor contains over 4 miles of welding. It is virtually inaccessible for welded repairs once it goes into operation.

A PROTOTYPE POWER REACTOR at Rolphton, Ontario, is using natural uranium to give a 20,000 kilowatt demonstration of Canada's nuclear future. The success of this initial power reactor is important in light of the discovery in Canada of some of the world's largest uranium deposits.

The project was sponsored jointly by the Atomic Energy Commission of Canada, Ltd., the Hydro-Electric Power Commission of Ontario, and the Canadian General Electric Co.

ALLOY SELECTION

The alloy from which reactor components would be made had to be weldable. This was of major concern to CGE designers and welding specialists and to the engineers from Air Reduction of Canada and the Aluminum Company of Canada who worked with them. The material had to provide the designers with the necessary strength, ductility, and corrosion resistance, and still be rated high in weldability. They chose one of aluminum-magnesium alloys.

The welding specialists were anxious to select an alloy with the lowest possible sensitivity to hot short cracks. This is a weakness common to some aluminum alloys, resulting from intergranular separation.

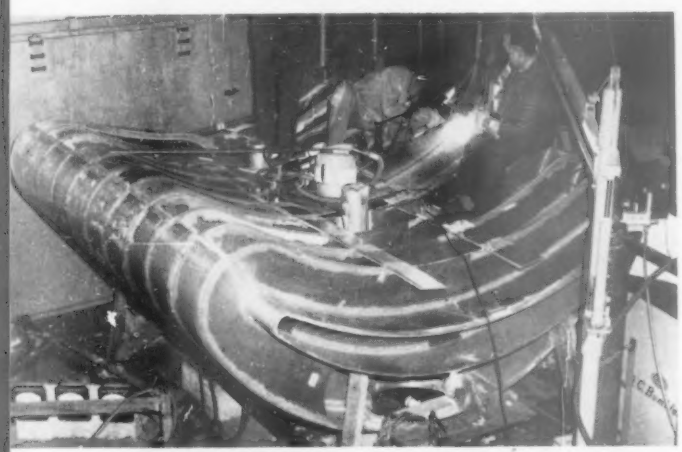
The susceptibility to cracking during welding becomes greater as magnesium is added to aluminum alloys,

reaching its peak when the magnesium content is about 1.5 percent. Increasing the content beyond this point, reduces crack sensitivity. However, materials with relatively high percentage of magnesium show signs of stress corrosion cracking and intergranular corrosion.

Alloys with a low magnesium content could not provide adqeuate strength for a unit that would weigh 200 tons when fully loaded. Therefore, a compromise was reached, selecting an alloy with 3.5 magnesium. The alloy was relatively new and untried outside the welding laboratories of aluminum suppliers, including Aluminum Company of Canada. However, Alcan rated the alloy "A" in weldability.

WELD REQUIREMENTS

The weldability was particularly necessary for the reactor core, or calandria tank, which becomes virtually inaccessible to welded repairs once in operation.



INSPECTORS CHECK every weld as it is being made. Here, the dump slot is being welded from the top side.

CGE used every possible nondestructive test on every inch of weld. They used visual examination for cracks; radiography (2 percent sensitivity); liquid penetrants; thermal, hydrostatic, and helium tests. All welds exceeded commercial standards and met or exceeded the code requirements for boilers and pressure vessels. Operators, all materials, and Airco's welding equipment passed rigid qualifying tests.

It is essential that no leaks occur in the barriers separating heavy water and light water, that the vessel be impervious to helium leakage, and that the welds provide the strength and ductility upon which the design of the reactor is based.

The reactor's original design was based on a pressure vessel-type of reactor. In this type of reactor, a large pressure vessel containing both the moderator and coolant controls the heat of the reaction and conveys its energy. The present design employs several advanced concepts that allow in-use refueling. The design is characterized by a process using natural uranium oxide as fuel, heavy water near atmospheric pressure as a moderator, and pressurized heavy water as a coolant.

PRESSURE TUBES

A series of pressure tubes, passing the length of the aluminum reactor cylinder, contain the coolant. In these tubes, in contact with the coolant, is the fuel. It is in the form of short slugs or bundles, each containing either 7 or 19 cylindrical fuel elements composed of uranium oxide sheated in zirconium alloy tubing.

Eliminating moving controls and shut-off rods within the reactor make possible high safety standards. Fuel is added from both ends of the fuel tubes. Outside the tubes, heavy water acts as a moderator. It is controlled by a fail-safe helium gas pressure-differential system and by the force of gravity. The moderating fuel is drained into and forced from a moderator tank situated below the reactor vessel.

COMPLEXITY

The calandria tank has over 4 miles of crucial weld passes. It is a cylindrical tank that rests horizontally in its vault. It is 15-feet-long and 19-feet-high. The inner shell is ¼-inch-thick aluminum and the outer shell is ½-inch-thick. Between these walls are ¼-inch thick supporting ribs.

Each end of the cylinder is double walled, with 2-inch-thick outer end walls and ½-inch-thick inner end walls. Between these walls, at both ends, are 132 reflector end tubes. Through these, from inner end wall to outer end wall, stretch 132 calandria tubes. These are 4 inches in diameter and .054-inch-thick. Within its inner wall, the calandria contains a heavy water (D_2O) moderator reflector. Between the inner and outer skins is a light water (H_2O) neutron reflector shield.

There is an area called the dump slot in the lower part of the calandria. This is double walled with ¼-inch and ⅜-inch skins strengthened by ¼-inch and ½-inch ribs. The inner dump slot contains light water. The heavy water moderator enters and leaves the calandria through this dump slot.

Automatic welding was used when possible. CGE used Air Reduction's fully automatic AMHB Aircomatic welding head mounted on a giant positioner and Aircomatic AH35A guns with special jigs and fixtures.

ATTENTION TO DETAIL

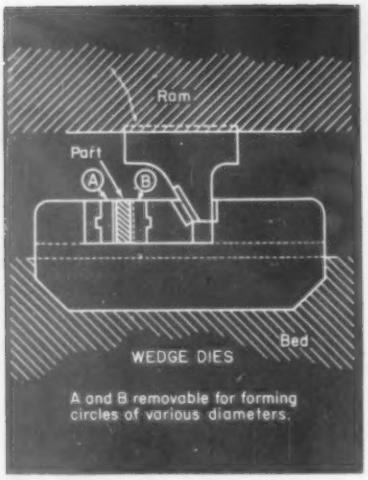
Operators attended special training courses at Alcan and were trained for 6 weeks at CGE's Peterborough plant. CGE wrote detailed specifications for every welded joint. These include such variables as fluid and time factors for pre-cleaning, interpass cleaning, exact electrical requirements, bevel angles, and minimum gaps.

A light bulb in the wire spool container kept wire free from moisture and helped prevent weld contamination.

This attention to detail was also needed in the welded aluminum moderator dump tank and its baffle assembly. Here's an idea of the force and stress put on the welds of the tank and its baffles: In an emergency shutdown, the dump tank drains the entire reactor in 10 seconds. This is equivalent to draining 13 railroad tank cars in 1 minute.

The dump tank is 13 feet in diameter and 19 feet long. The shell is ½-inch-thick and its ends are capped with dished heads. The huge baffle assembly transfers the force of the dumping fluid to an exterior saddle arrangement.

The aluminum alloy with 3.5 magnesium was used for the moderator tank. Its special properties were not needed, but it did provide a dry-run for the welding of the calandria tank. • •



YOU GET MORE for your money if you can keep your press brake busy. Wedge-action tooling is a good way to do it. It turns the vertical ram motion of a standard press brake into horizontal force. It's used to make gear rims, gear guards, rings, and other circles and semicircles. It eliminates the need to roll these heavy parts on big bending rolls and the initial press brake bump that has to be made on the bar, anyhow. Wedge tooling also goes on and off the press brake in a hurry.

Circles: A new job for press brakes

IN BRIEF: Want to get more work out of your press brake? Here's how a leading manufacturer does it with quick-acting tooling they developed.

DID YOU KNOW you can make giant rims, gear guards, rings, and other circular and semicircular parts on a press brake? The Cincinnati Shaper Company does it frequently with tooling they developed.

The traditional way of making heavy circles is with massive bending rolls. But not very many plants can afford a special machine to do short run work. Besides, with bending rolls you have an extra operation: you have to put a radius in the end of the bar—or you'll never roll a circle. This extra step is usually done in a press brake.

Most metalworking plants have a press brake. Cincinnati uses seven in building press brakes and shears. And, like many manufacturers, they can use only so many heavy circles. That's one reason the company developed wedge-action dies. The other reason: more jobs for press brakes.

Wedge tooling turns vertical ram motion into horizontal force. The wedge, bolted to the press brake ram, forces the O.D. die against the work. This forces the work against the I.D. die and shapes the part. The O.D. dieholder, tapered like the wedge, slides in a heavy, closed-end casting that bolts to the press brake frame. The casting prevents the I.D. from moving. Wearing surfaces of wedge and die holder are hardened. When the wedge up-strokes after a hit, a spring returns the movable die to the open position, allowing the operator to feed the bar for the next hit. O.D. and I.D. dies are inserts quickly replaceable to make different diameter circles.

Wedge-action tooling bends heavy metal quickly, but without requiring heavy press tonnage. Cincinnati bends 2- by 4-inch bars of 40 carbon steel to make 35½-inch diameter gear rims in just two minutes. It also wedge-forms 2½- by 10-inch gear rims in 6-foot diameters. Another job: Wide, ¾-inch-thick gear guards.

Wedge tooling sets up quickly. Millrights bolt the wedge to ram, line up the die assembly underneath, and bolt it to the press brake frame. Then they bolt a large, 1-inch-thick plate to the frame. This is the work table. It goes around the dies and keeps the work level during bending.

With the aid of a couple of idler-roll stands, one operator and helper makes all the rims and guards the company needs for some time. The operator overlaps hits to make true circles. And with wedge forming done, tooling is whisked off, freeing the press brake for other jobs.

After forming, Cincinnati assembles rim with web and hub and welds. Finally, it cuts and hardens teeth. • •

SEE HOW PAGE PROVIDES THE

SELECTION
PACKAGING
SERVICE
INVENTORY CONTROL

to improve your welding operations

You can get just the right wire for your welding operations from PAGE. Because we offer a choice of 33 analyses—the largest selection in the industry—wires are available for practically any job. And when a particularly *tough* welding problem exists, PAGE can often develop a special wire to solve it.

From single coils to 1200-lb. Payoff-pallets, PAGE can supply the packaging that offers you the greatest convenience in handling, storage and use. You can specify the packaging that meets *your* requirements.

Nationwide service helps you meet your welding needs quickly and efficiently. A coast-to-coast network of distributors, backed by strategically located warehouses, assures prompt delivery.

Typical color-coded label for reels—as grades of wires change, so do colors

Cartons, spools, Payoffpaks and Leverpaks included in PAGE color-coded packaging

Simplified inventory and reduced scrap loss are the results of PAGE's new color-coding program. For the first time, you can purchase *all* your automatic welding wire with permanent, color-coded identification. What's more, each color-coded label shows complete data on grade, size, heat number, weight and order number.

In all these ways, PAGE can help improve the quality of your welding operations, reduce your costs, simplify your stocking and handling. PAGE welding specialists are available to give expert advice. That's why it makes sense to bring your welding problems to PAGE.

***Write** for information on the complete line of PAGE welding wire. **Folders DH-402** and **DH-1218** list PAGE analyses, describe packaging, include most competitive makes. New color-coding identification card available.*

PAGE

PAGE

WELDING WIRE

Page Steel and Wire Division • American Chain & Cable Company, Inc.

Monessen, Pa.*, Atlanta, Chicago (Melrose Park)*, Denver*, Detroit, Houston*, Los Angeles* New York, Philadelphia*, Portland, Ore., San Francisco*, Bridgeport, Conn. *Indicates PAGE warehouse stocks

ACCO

—the source for answers to welding problems

For More Information Circle No. 57 on Reader Service Card.

NO ONE LIKES BEING the horrible example, but this sandal-shod welding operator is.

SPECIAL REPORT

300,000 welding operators need safety shoes

says **ROBERT A. ANDERSON,** *assistant editor*

THIS IS ONE of the most important facts to come out of a survey I just completed. I always thought that many welding operators were not wearing safety shoes, because I've seen so many in loafers and tennis shoes. But, I was shocked when my questionnaires came back from safety shoe manufacturers and companies that use welding. I found 300,000 operators were not wearing safety shoes.

Even in plants that encourage the wearing of safety shoes, welding operators don't wear them. They think they don't need them. The truth is that welding operators are twice as vulnerable as most workers. They have to guard against crushing by falling metal and against burning by sparks and spatter. Street shoes offer practically no protection against these hazards.

Injury and loss of toes are inexcusable! I just can't understand why operators fail to wear safety shoes. These shoes are as comfortable and as attractive as any others. And, their price is reasonable when you consider the cost, pain, and inconvenience of accidents. Here's an example:

A welding operator had four metatarsal bones broken when a skid was pulled across his feet. Time lost: 143 days; temporary disability was $612 and permanent disability payment was $900. These payments were made by the State Compensation Board but are charged against the employer whose regular monthly payments into the fund get bigger as his accidents increase.

With luck, you and your company can get by for less. With even greater luck, you might not have any accidents. But, why take chances?

turn the page for how-to-buy-them information . . .

Choose shoes from these styles...

PEOPLE WHO MAKE safety shoes recommend a variety of safety shoes for welding operators. The photos above show three of the styles available. They all have safety toes and two have no laces to burn. The shoe at lower left has laces, but they are covered with an instep protector.

Soles are made from many materials. The chart (opposite page) shows the footing quality (grip, cushioning, etc.) of each material on various floors.

There is no such thing as a rubber-soled shoe anymore and leather-soled shoes are passe. Soles are either synthetic rubber or composition materials.

The most popular safety shoe sole is Neoprene, a synthetic rubber. It resists heat, acid, doesn't slip, and wears long. Other materials can be combined with it: nylon cord for long wear or cork for lightness. Another favorite is Neoprene crepe, which is Neoprene filled with tiny air bubbles. The crepe is lighter and cushions better than solid Neoprene. Penalty: Wearing quality is sacrificed for lightness.

The leather uppers in safety shoes depend on the manufacturer. Many grades and kinds are used, including elk, horsehide and cowhide, depending on the use.

Some manufacturers have standardized on one type of sole and one type of leather upper. They treat the leather so it resists most elements. Other manufacturers offer a selection of soles and uppers.

These people make safety shoes . . .

Bronson Shoe Company; Dorsey Safe-T-Shoe Division, Industrial Supply Co.; Ellwood Safety Appliance Co., Genesco Corp.; Haus of Krause, Division of Wolverine Shoe & Tanning Corp.; Hy-Test Division of International Shoe Co.; Iron Age Safety Shoe Division of H. Childs & Co., Inc.; Knapp Bros. Shoe Mfg. Co.; Lehigh Safety Shoe Co., Inc.; Thom McAn Safety Shoe Division; Mine Safety Appliances Co.; Record Industrial Co.; Safety First Shoe, Inc.

ARE SAFETY SHOES ENOUGH?

Most welding operators need toe protection. The three shoe styles shown above do this job. However, most operators need additional protection. They might wear the metatarsal guard (upper right) on any lace-up shoe to protect the laces and their feet from spatter burns. Many safety men believe everyone needing safety shoes should also wear these guards. They are made of 20-gage stainless, backed with Neoprene sponge. You can put them on or take them off in seconds.

The spat (lower right) protects against spatter. It is made from leather, fireproof cloth, or asbestos; and in hip, knee, or ankle lengths. It should be worn with a safety shoe.

WHAT SOLE IS BEST FOR DIFFERENT KINDS OF FOOTING?						
KIND OF FOOTING	LEATHER	PREMIUM	NEOPRENE	CORK	COMPOSITION	WOOD
Oil, Grease	GOOD	EXCELLENT	EXCELLENT	GOOD	POOR	EXCELLENT
Chemicals	FAIR	EXCELLENT	EXCELLENT	GOOD	GOOD	EXCELLENT
Metal Chips	FAIR	EXCELLENT	GOOD	GOOD	FAIR	EXCELLENT
Heated Surface	POOR	EXCELLENT	GOOD	EXCELLENT	FAIR	EXCELLENT
Cement	GOOD	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT
Cinders	FAIR	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT
Slippery Surface	GOOD	GOOD	GOOD	GOOD	GOOD	EXCELLENT
Water	GOOD	EXCELLENT	EXCELLENT	EXCELLENT	GOOD	EXCELLENT
Cushioning Good?	POOR	GOOD	POOR	EXCELLENT	FAIR	POOR

How to put safety shoes on your welding operators

THERE ARE MANY WAYS to get safety shoes to welding operators. These are the best known:

- *The shop store*: It's most convenient because men can get safety shoes during working hours.
- *The mobile shoe store*: It will stop at intervals or whenever a plant has a list of buyers.
- *The local shoe store*: It will make arrangements to sell safety shoes, sometimes at a discount.

THE SHOP STORE

Any shoe manufacturer will go all out to help companies set up their own shoe store. A large inventory isn't required. The supplier will determine what inventory is needed on the basis of the number of employees. If more shoes are needed, they are only a few days away by mail.

FITTING IS SIMPLE, YET IMPORTANT

A safety shoe program will be over before it starts, if the shoes don't fit. The welding operators just won't wear them.

However, almost anyone can be a fitter with some training. Shoe suppliers will train these fitters and will supply the necessary measuring equipment.

HELP PAY FOR SHOES

Some companies go to great extremes to get their employees to wear safety shoes. Some pay 25 to 50 percent of the cost of shoes; a few companies pay the full cost. A payroll deduction plan is used by many firms to make it easy for employees to pay for shoes.

SELL, SELL, SELL

It's an open and shut case. There is every reason in the world why welding operators should be wearing safety shoes and no real reason why they shouldn't. But, company management must sell them on the idea. One way is to show them on shop bulletin boards and billboards. Company newspaper can help by telling what happened to welding operators who didn't wear safety shoes.

Workers should have a chance to inspect and try out safety shoes before they pass judgment on comfort and looks. There are safety shoes on the market today so stylish they can be worn to church. • •

WE OWE THANKS to the companies who supplied the information necessary for this article. We also owe thanks to the following for supplying photographs of their products: Bronson Shoe Company; International Shoe Co., Hy-Test Division; Albert W. Pendergast Safety Equipment Co.; and Safety Clothing & Equipment Co.

A DESIGNER'S GUIDE TO WELDING

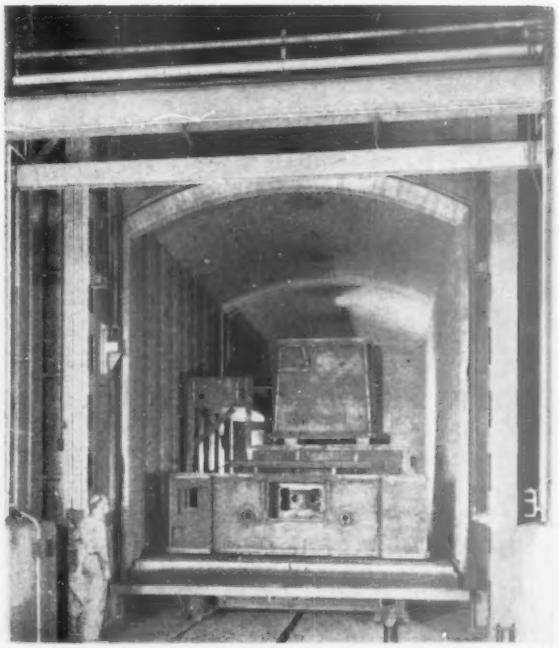
this is Part V of a series of articles that show you how to use the economy and advantages of arc welded steel to reduce manufacturing costs. Here's an expert's opinion on . . .

The pros and cons of stress relieving

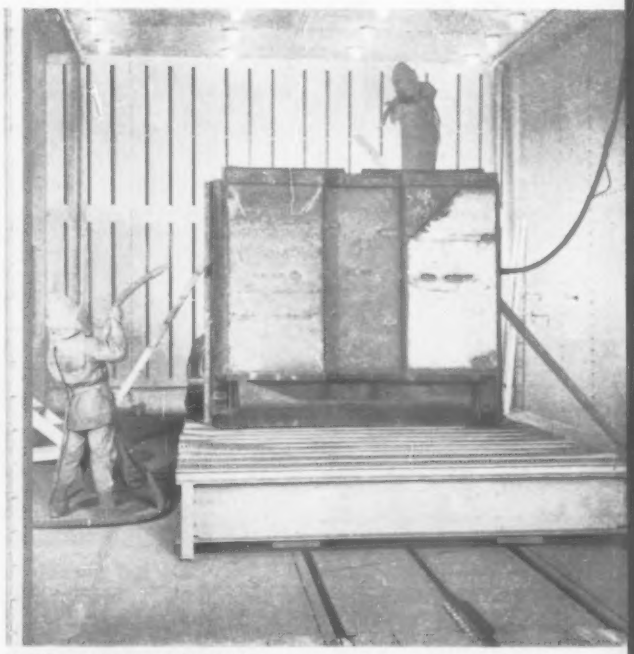
by **M. J. SHOELSON,** *supervisor, welding engineering, Clearing Div., U. S. Industries, Inc., Chicago*

IN BRIEF: Experience may justify the elimination of stress relief in some cases, but the author feels stress relieving is good insurance against failure when in doubt. He feels the stress relief furnace must remain an essential tool of the weldment fabricator.

STRESS RELIEF REMOVES residual stresses in weldments, usually by heating and soaking in a furnace. The process is different from annealing where phase transformation takes place. Annealing does relieve stresses, but is used principally to refine the grain structure and improve the metallurgical characteristics of the weld. Stress relieving to 1100-1175°F (for mild steel) produces no change in grain structure, but relaxes the stress field by plasticizing the structure. Generally, stress relief causes a dimensional change in the weldment. This is due both to the relief



STRESS RELIEVING OVEN measures 44 x 18 x 26 feet and gives temperatures up to 1900°F. Its electronically-operated doors with special sand-sealing maintain the soaking temperature (usually 1175°F) reached at the rate of 100-125°F an hour. The length of the soaking period depends on the thickness of the steel.



WELD SPATTER AND SCALE are removed from weldments in this shot blast room by steel shot propelled by 100 psi air pressure. The floor of the 40-foot-long shot blast room and the platform on the electrically-operated rail cars are perforated. This allows spent shot to fall into a hopper beneath the floor.

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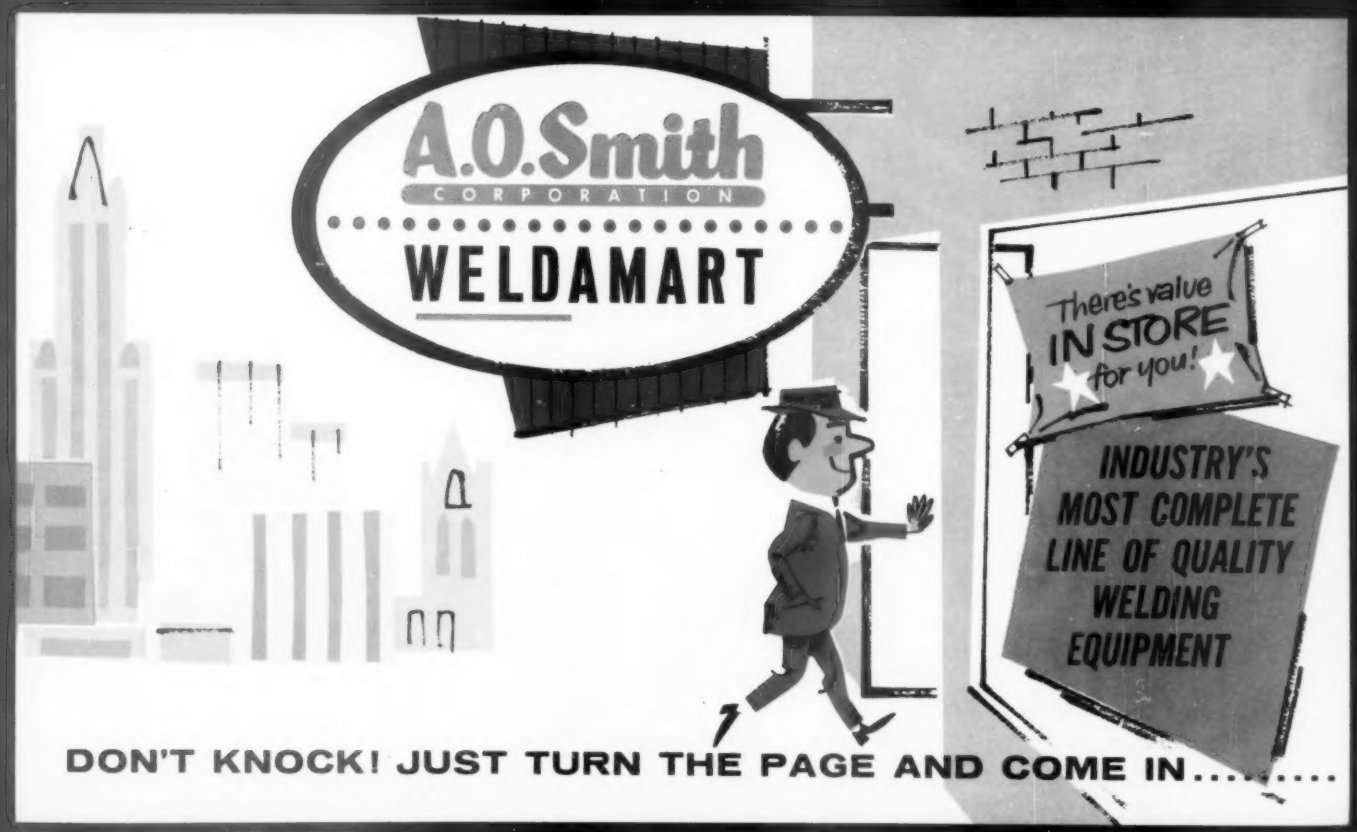
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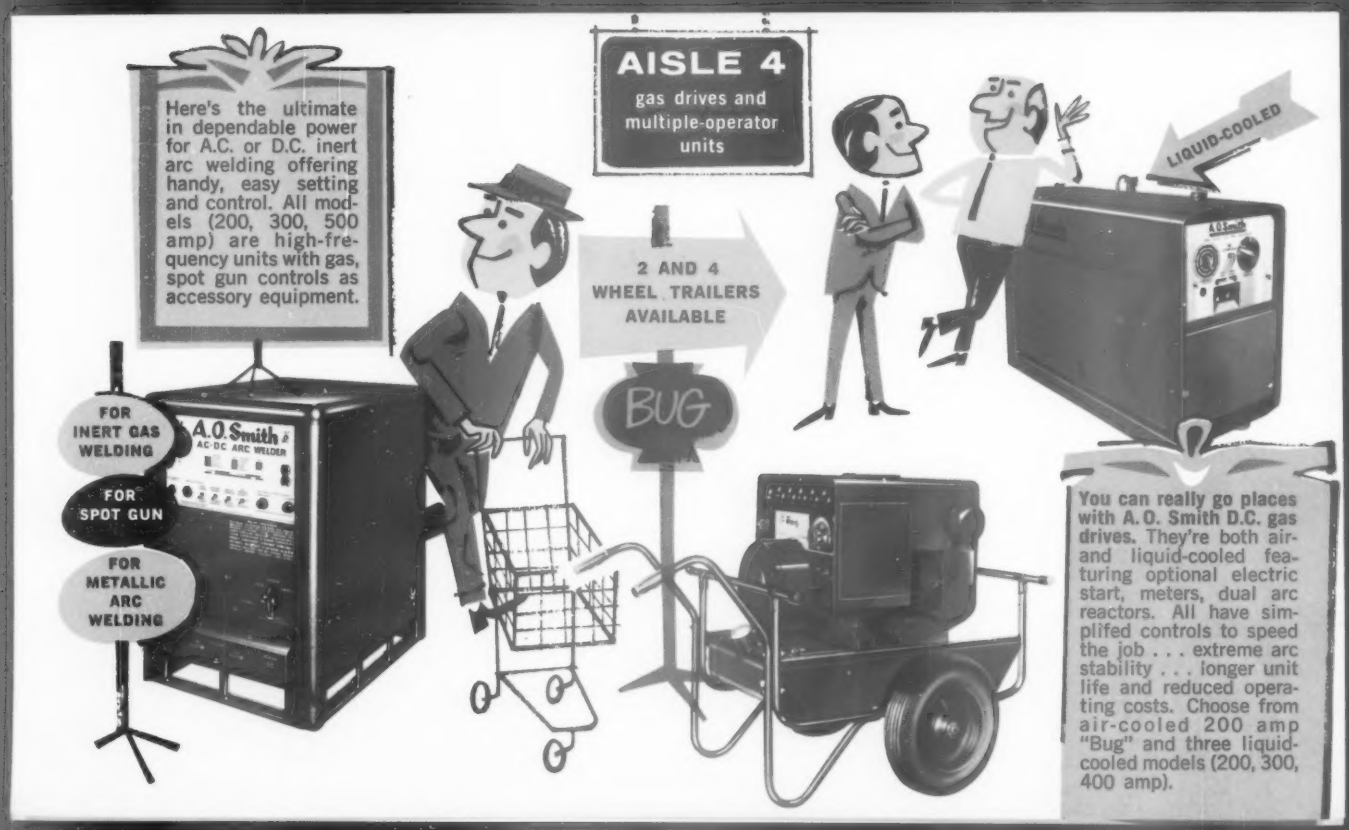
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process and to sagging at stress relief temperatures.

OTHER WAYS TO STRESS RELIEVE

Shot peening is used to relieve stresses. Primarily, it superimposes a surface compressive stress field on the existing residual stress field. Resistance to cracking is increased because failure ordinarily starts at a high tensile stress area on the surface. But, shot peening cannot truly be considered a stress relieving operation. The conventional way to remove the scale formed on a weldment's surfaces during stress relief is by shot blasting, much the some process as shot peening. Thus, the normal stress relief operation makes use of the skin effect of shot peening.

Time helps relieve stresses. Locked-in stresses work themselves out of a structure under some conditions, particularly if the structure is banged around, or subjected to shock and vibration during normal service.

WHAT CAUSES STRESSES?

There are many ways to introduce residual stresses to a weldment. Rolling, bending, forming, and other cold-working processes; shrink-fits, and pre-machining do it and all are used on the plates or inserts incorporated into weldments. But, naturally, the welding process itself produces most locked-in stresses.

Severe dimensional changes that occur locally during the welded cycle are caused by two things: The thermal coefficient of expansion and the metallurgical phase transformations, which have only two ways to accommodate themselves. If there is little constraint or if the weldment is light, the structure will distort. On the other hand, a highly constrained weld will absorb the local expansion by straining, resulting in locked-in stresses.

Without quantitatively analyzing the effect of three dimensional thermal stresses, you can realize how serious this phenomenon is. Consider that thermal stress in steel for undirectional constraint (as in a bar) is 240 psi per degree (F) temperature rise. Residual welding stresses easily achieve yield stress levels. The distribution of the stress field is practically indeterminate, but is generally distributed as local high tensile regions surrounded by large, low stress regions.

THE PROS AND CONS

Once we appreciate the magnitude and mechanism of the phenomenon, we must understand its significance. The subject becomes controversial now because the effect of this stress field on the function of the structure must be established. Clearly, the need for stress relief depends on the ultimate use of the weldment. It is ridiculous to take the unqualified stand that stress relieving is beneficial or not. For some weldments, it is throwing away money or even looking for trouble. For others, it is critically important.

First, consider a weldment that requires extensive machining and which must maintain close dimensional stability. A locked-in pattern of stress can be released by machining, just as a cable releases its load if cut. As I said earlier, locked-in stresses can also work out in service. In either case, the structure is rendered dimensionally unsatisfactory. Where dimensional stability is critical, stress relieving is mandatory.

Under certain conditions, structures subjected to stress while in a corrosive environment will development cracks. Welds are focal points for the inception of stress corrosion cracking for two reasons. Intergranular precipitation of carbides, particularly in austenitic stainless steel, or sensitization occurs at welding temperatures, allowing galvanic activity between dissimilar grains. Incipient cracks formed this way act as stress raisers. Residual stresses, particularly intense at the welds, accelerate the cracking failure. This phenomenon can be minimized by careful choice of materials, but the most straightforward cure is postweld heat treatment. This relieves the stresses and, for stainless steel heated to 1600°F, dissolves the carbides as well.

STRESS RELIEF FOR SEVERE SERVICE?

It is often recommended that weldments subjected to severe service be stress relieved. This point should be clarified.

A ductile steel member subjected to static stress fails by yielding rather than by fracture. But the same member subjected to fluctuating load can experience brittle failure at a level of stress considerably less than yield stress, the fracture always occurring at a point of stress concentrations. Unfortunately, the endurance limit based on polished specimen tests cannot be used as a design stress for unlimited life for a member subjected to fluctuating load. The effective reduction in strength depends also on the stress concentration geometry, the notch sensitivity, and on the size of the member. The larger the part, the greater the tendency toward fatigue failure. It is hopeless to design without stress concentration, particularly weldments where every weld is a point of stress concentration. Thus a weldment must be designed for very low stress levels if it is to be capable of infinite life while operating under fluctuating load. Residual stresses are intolerable under these conditions, when superimposed on working stress.

If any of these conditions apply, be cautious about eliminating stress relief. Unfortunately, large structures—the most difficult and costly to relieve—are the worst offenders. Some users have had satisfactory experience with unrelieved weldments, but then generally the life requirement would be more than 10^4 or 10^5 cycles rather than 10^7 cycles, normally considered infinite life. Furthermore, severe shock loading would often be encountered. Shock and vibration could work out the residuals before the structure would be damaged, but the effect is not absolutely predictable, and experience must be a guide.

Do not think that stress relief is a cure-all. If used without proper control of the heat cycle, additional stresses can be introduced. Both heating and cooling must be slow enough to avoid abrupt temperature changes (about 100-125° per hour). The structure must be adequately supported in the furnace to prevent sagging while it is in the plastic state, and must remain in the furnace long enough for equilibrium temperature to be attained.

Stress relieving can cause embrittlement of welds on some high-strength steels. Here, the cure could be worse than the ailment. There are electrodes available for alloy steels that are not very sensitive to stress relief embrittlement. • •

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Brazing know-how

IN BRIEF: $1/2-million of modern capital equipment and a staff of production and research metallurgists and furnace design engineers are used by the Pyromet Company to develop techniques for furnace brazing unusual metals and complex assemblies.

Guides to furnace brazing . . .

Materials: Determine composition of metal, its condition before brazing, and the stresses to which it has been exposed. Is the surface oxidized, need pickling? Has it been shot- or grit-blasted, cold finished, machined, ground, or burnished? Do certain alloys prevent making sound joints? What effect will the brazing environment have on the metals being brazed?

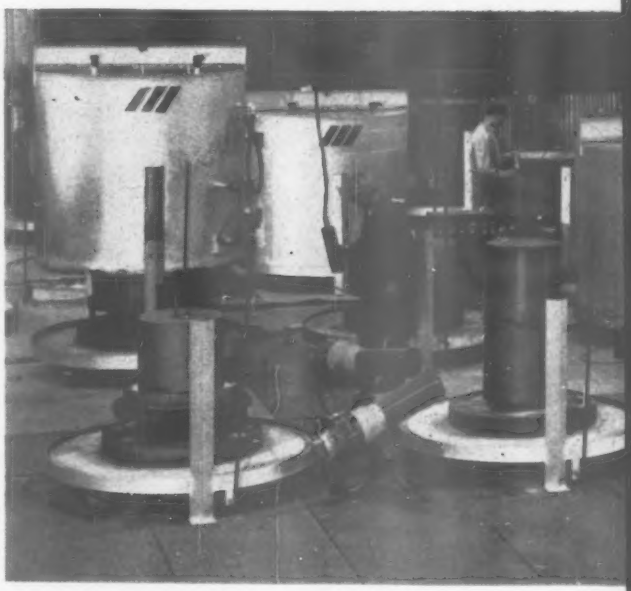
Brazing alloys: Study alloys for strength, operating conditions, wettability, melt and flow temperatures, compatability of alloying characteristics with base metals, available forms (wire, shim, powder, paste) and freedom from contaminants.

Joint clearances: Suit designs to the brazing alloys. Will the alloy give good penetration? What is its strength? If manufacturing methods rule out proper joint clearances, what are alternate methods?

Joint preparation and cleaning: Choose from vapor degreasing, washing, acetone or solvent cleaning, pickling, prefiring in dry hydrogen, vacuum degassing, and plating.

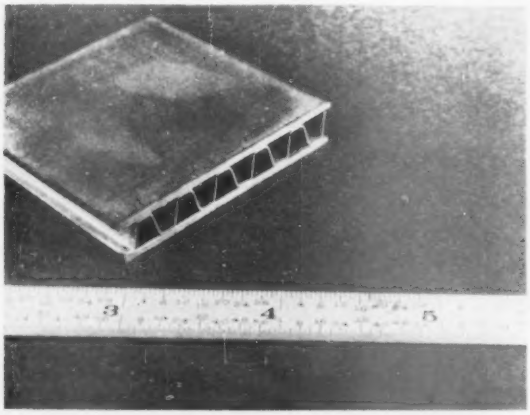
Brazing alloy application: Consider location, method of application, quantity of alloy, and masking techniques needed to suit each job.

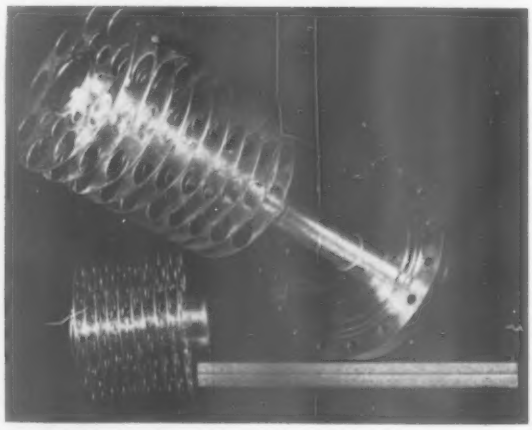
Heating: Choose between furnace, salt bath, and induction methods. Furnace and induction brazing can be done by using dry hydrogen, vacuum, or other gaseous environments. Purity, dewpoint, purging, and sources of contamination regulate success of environmental brazing. So do proper furnace loading, retort size, type of supports and fixtures, corrected heating and cooling cycle, and accurate measurement of temperature on the work and in the furnace.



BELL-TYPE FURNACES are used for production brazing, bright annealing, and heat treating in dry hydrogen, dissociated ammonia, or argon.

VACUUM BRAZING (10^{-4} mm pressure) was used to make this lightweight Rene 41 structure. GE J8600 brazing alloy (Ni-Pd) was used.



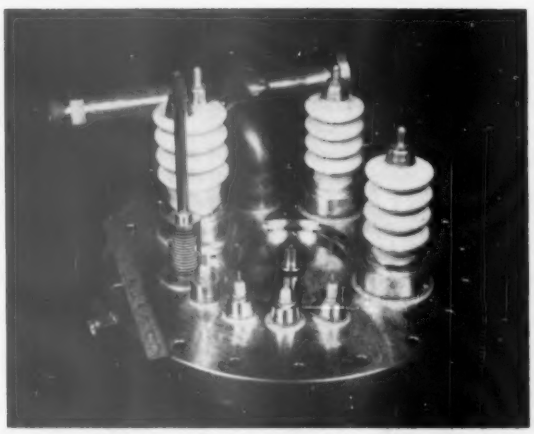


DRY HYDROGEN furnace brazing was used to make this baffle assembly for a cold trap. Copper brazing alloy joined nickel and AISI 304 stainless steel.

meets jet-age requirements

YOU NEED a wealth of engineering know how to braze products to suit the missile, aircraft, atomic energy, and electronics industries. That's why companies like Pyromet Company of San Carlos, California, have production and research metallurgists and furnace design engineers on their staffs. It's why they have more than half a million dollars of capital equipment they use around the clock. It's why they develop techniques for furnace brazing unusual metals, complex assemblies.

Pyromet's five metallurgists serve companies that do not have experienced brazing metallurgists. These men start work with the customer early in the planning stages. They assist the customer in the initial design of an assembly, advise on materials and brazing techniques. They guide their work with the checklist on the opposite page.



STEP-BRAZING made this vacuum feed-through assembly. Materials: Ceramic, AISI 304 stainless, OFHC copper. Brazing alloys: Cu-Ni--Au, Ni-Au, and Cu-Ag.

DRY HYDROGEN BRAZING

One of Pyromet's specialties is dry hydrogen brazing. Carefully controlled atmospheres prevent oxidation except on metals containing appreciable titanium and aluminum. There are other reasons why Pyromet likes dry hydrogen brazing:

No brazing flux is needed so there is no danger of entrapped flux weakening or corroding joints. Nor is there any flux trapped in areas that might be exposed to vacuum; for example, a vacuum tube assembly.

Cleaning is unnecessary; parts come out of the dry hydrogen furnace clean and bright.

Parts are joined that cannot be brazed in an ordinary atmosphere.

Complex and multicomponent assemblies can be joined by step-brazing.

When they braze heat-resisting alloys in dry hydrogen, Pyromet knows they must be familiar with the metal oxide equilibria of the metals in hydrogen. The dew-point of the hydrogen atmosphere must be related to the temperatures at which various metals are in equilibrium with their oxides. At equilibrium, rate of oxidation of the metal by water vapor is exactly equal to the reduction rate of the oxide by hydrogen. If water vapor content, or dewpoint, increases while the temperature is stable, the equilibrium is disturbed and water vapor starts to oxidize the metal until equilibrium is restored. On the other hand, when the dewpoint is lowered, the excess of hydrogen replaces the oxide to reestablish the equilibrium.

VACUUM BRAZING

Pyromet is also expert in vacuum brazing. They feel this process widens the scope of brazing considerably. For instance, certain combinations of metals used in missile and electronic components cannot be joined satisfactorily by other brazing methods. Tantalum and columbium become brittle if they are brazed in atmospheres containing minute amounts of atmospheric gases (hydrogen, oxygen, and nitrogen).

The vacuum process encourages wetting and flow-

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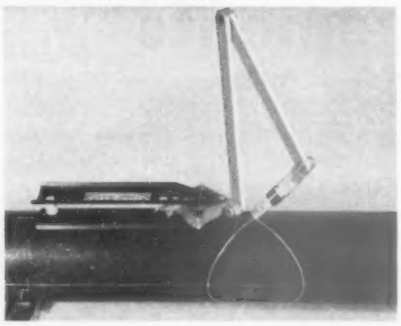

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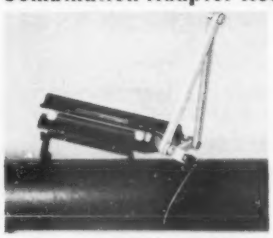

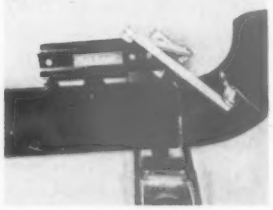

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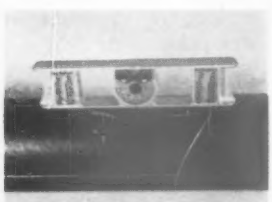
It allows him to mark compound angles in one setting of the tool, also to mark off any portion of tube turns or 90 degrees he would so desire, as you will note in self-explanatory pictures.

The combination adaptor will also be furnished for the Jumbo Contour Marker on special order.

This tool will be sold by your welding distributor as an accessory to the Contour Marker.

Pro - Mag - Level



This level is designed for the fitter, welder, jig builder, for any layman who has angle or setting problems. The Pro-Mag-Level is 9" in length, 2" high, ¾" wide, weighing a total of 10 oz., a convenient pocket size. One side is machined to a flat plane for flat surfaces, the other side is machined to a slight V-plane for pipe work.

Body of level is made of strong aluminum casting to maintain lightness of tool. Scales are imprinted on one end for rise in degree per foot, on the other end degrees in rise per meter are imprinted.

Equipped with level and 90 degree dial marked in 2½ degrees, held in place by screw with pressure washer for easy setting.

Frame of level is equipped with two magnets on each plane for holding level in desired position, allowing the layman a third hand. Pictures of tool are self explanatory.

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FURNACE BRAZING

continued from page 51

ing during the brazing cycle by preventing oxidation and outgassing the parent materials and the brazing materials. This produces stronger, more uniform joints, minimizing porosity and brittleness.

VACUUM PRESSURE BONDING

Pyromet Company brazes composite metal layers using the Hortonclad process, under a license agreement with Chicago Bridge & Iron Co. This process produces a continuous bond between dissimilar metals for a wide variety of applications, including heat exchanger (petroleum refining), missile components, and klystron transmission hardware (electronics). The desired alloy is integrally and continuously bonded to the backing plate by the application of heat, vacuum, and pressure. A thin alloyed nonferrous metal layer at the interface bonds the two metals together. This layer also acts as a barrier against the migration of carbon from the backing plate (in the case of steel) to the alloy facing. Close metallurgical control assures composite materials of uniform high bond strength and purity.

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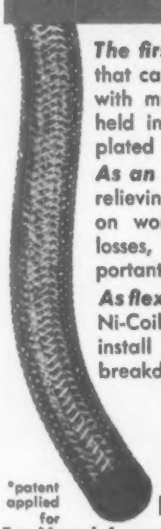

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12	24	36	48	60	72	84	96	108	120	132	144	156	168

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NEW PRODUCTS

200	206	212	218	224	230	236	242	248
201	207	213	219	225	231	237	243	249
202	208	214	220	226	232	238	244	250
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204	210	216	222	228	234	240	246	252
205	211	217	223	229	235	241	247	253

FREE LITERATURE

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NOV. 1961

Circle item numbers for additional information about products described and advertised in this issue.

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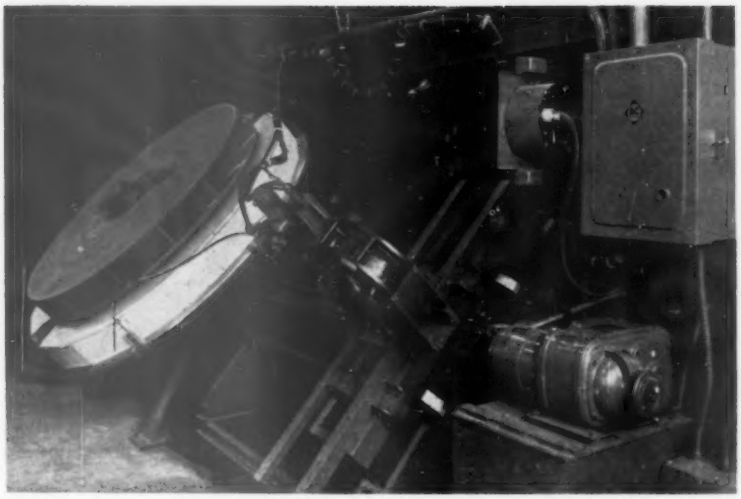
The most modern Reader Service Department in the publishing industry, staffed and trained to help readers. Automatic equipment processes your requests and shoots them on for fulfillment within hours after receipt. The materials you want get to you — fast.

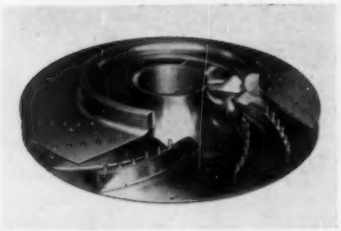
These cards are your tickets to this prompt service. Use them to secure details about any item in this issue that has a key number. For instance:

ADVERTISEMENTS—a showcase of the latest in components, equipment and techniques.

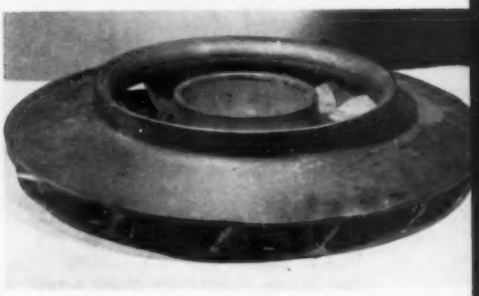
NEW PRODUCTS—brief descriptions of significant new products and materials.

NEW LITERATURE—offerings of new catalogs, data books, price lists, and other valuable reference material.





OLD: Spinning this riveted impeller too fast invites its destruction.



NEW: Two years of experiment and this $40,000 welder made possible the improved impeller (right). This one has been overspun without harm to the welds. Only the parent metal suffered.

Automatic welding KO's impeller rivets

by **EDWARD SOREF,** *Allis-Chalmers Mfg. Co., Milwaukee*

IN BRIEF: The experts had to admit they were wrong. A-C proved you can weld impellers automatically, and make them better in every way.

TURBO COMPRESSORS OF THE FUTURE will be more compact and less costly than today's models thanks to welded impellers. Welded impellers, we've found, are stronger and more reliable than riveted. Because of this, they can turn much faster. And faster impellers will eventually mean fewer compressor stages.

We used to rivet all our impellers. We riveted the countersunk hub and cover discs to the curved blades by peening the red-hot rivets with a sledge.

This way of making impellers was slow. It took three men: One to heat the rivets with a torch, another to hold the peening tool, and a third to wield the sledge. It was enough to make a cost-conscious engineer sigh and mutter: "There must be a better way."

When you look at an impeller you can't see the inside end of the blade; it curves out of sight. Also some of our impellers have blades barely over an inch wide. These conditions prevented manual welding from becoming the "better way." You've got to be able to see and reach what you weld, if you weld by hand.

Automatic welding was the logical way to weld impellers. But the experts allowed it couldn't be done. We proved it could be done—with automatic submerged arc welding. It took two years of experimenting, a new torch, and a complicated device to guide the torch along the blade. The machine cost us $40,000, but it made us the first compressor builder able to weld enclosed impellers automatically.

IMPELLER-MAKING STEPS

We assemble impeller parts hot and keep them hot during welding. Here are the steps:

1. Position the blades on the hub disc.
2. Fillet-weld them to the hub disc.
3. Inspect the welds with magnetic particles.
4. Center the cover disc over the hub disc.
5. Weld the blades to the cover disc.
6. Inspect the assembly with magnetic particles.
7. Stress relieve.
8. Machine.

Our first production-welded impellers went into a 4-stage steel mill compressor. After 10 years of constant running, the rotor came back to us for inspection. We found no cracks. We've welded hundreds of impellers—some of them 76 inches in diameter. Many of these big ones are still on the job.

TESTS PROVE WELD STRENGTH

Welded impellers are better than riveted ones, be-

For More Information Circle No. 66 on Reader Service Card.

cut weld cleaning time by 85%

THROW AWAY YOUR COLD CHISEL AND WHISK OFF WELD SPATTER WITH A DRY RAG! Protect-O-Metal spatter-proofing compounds make weld cleaning a breeze. Improve your welds at the same time . . . P-O-M compounds quiet the arc, improve oxidation and annealing scale, cause no porosity. No smoke, odors, or fumes.

P-O-M No. 2. Non-inflammable, non-toxic, water-soluble paste. Inorganic. Thin before applying and start welding at once. $3.40 per gallon, f.o.b. Dayton.

P-O-M No. 8. Rust- and corrosion-resistant resin base compound. Comes ready to use. Safe for all metals. Good paint primer; permits outdoor storage of sub-assemblies. $3.45 per gallon, f.o.b. Dayton.

Money-Back Trial Offer. Order a trial gallon of each today for testing in your shop. We'll cancel the bill if you're not satisfied.

Prevents Heat Treat Scale . . . up to 1500°F. Brush on, heat, brush off. All metals.

PROTECT-O-METAL

G. W. SMITH & SONS, INC. • 1701 Spaulding Rd., Dayton 3, Ohio

WELDED IMPELLERS

continued from page 53

cause you can make them good and make them fast. Welded impellers have a better aerodynamic form. You can use common bending rolls to make the blades. To make riveted blading you need costly dies and precise forming to make holes on blades and discs line up.

High welding currents gave us strong, deeply penetrating welds on impellers. The welds had no cracks to foster oxidation or erosion. To prove strength, we spun a welded impeller to destruction. It deformed, as you'd expect, but the welds didn't crack. Several blades, however, cracked in the parent metal at the inlet end. When, for comparison, we tested a riveted impeller the same way, the rivets sheared.

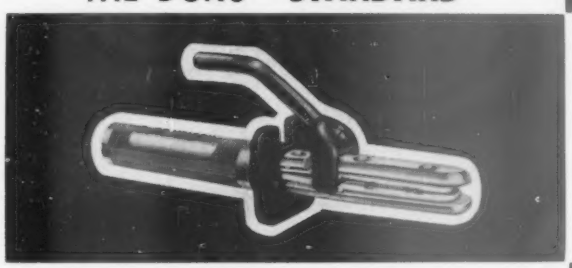
WELD BONDS BIG AREA

The superiority of welded impellers is borne out another way. Suppose you could weld blades with a fillet weld having only a 1/64-inch leg. This tiny bead would equal the cross sectional area of all the rivets in an old-style impeller. And we use at least a ¼-inch fillet.

Our impellers are usually heat-treated alloy steel or heat-treated martensitic stainless steel, if resistance to corrosion is important. Our standard test on impellers is to spin them beyond rated speed, then inspect them with magnetic particles. They've got to be good to pass. • •

DURO ELECTRODE HOLDERS

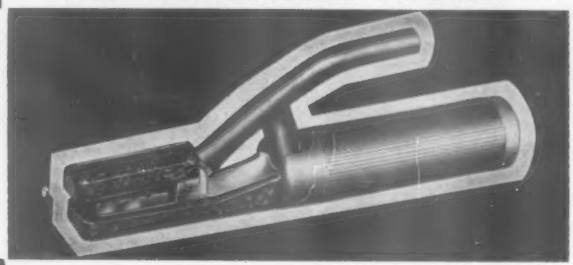
THE DURO "STANDARD"



- Jaws designed to reach hard to get at places.
- Cool operation—cool handling
- Fully insulated to protect the operator.
- All parts easily replaced.

For further information and name of nearest distributor write:

THE "ADJUSTABLE TENSION"



- Easy adjusting of Spring Tension for your requirements.
- New type cable connection prevents fraying of cable.
- Made in Bronze or Light Weight Aluminum models.
- All parts replaceable including copper alloy jaw.

THE DURO ENGINEERING COMPANY

31 Oregon Avenue, Hamden 17, Connecticut

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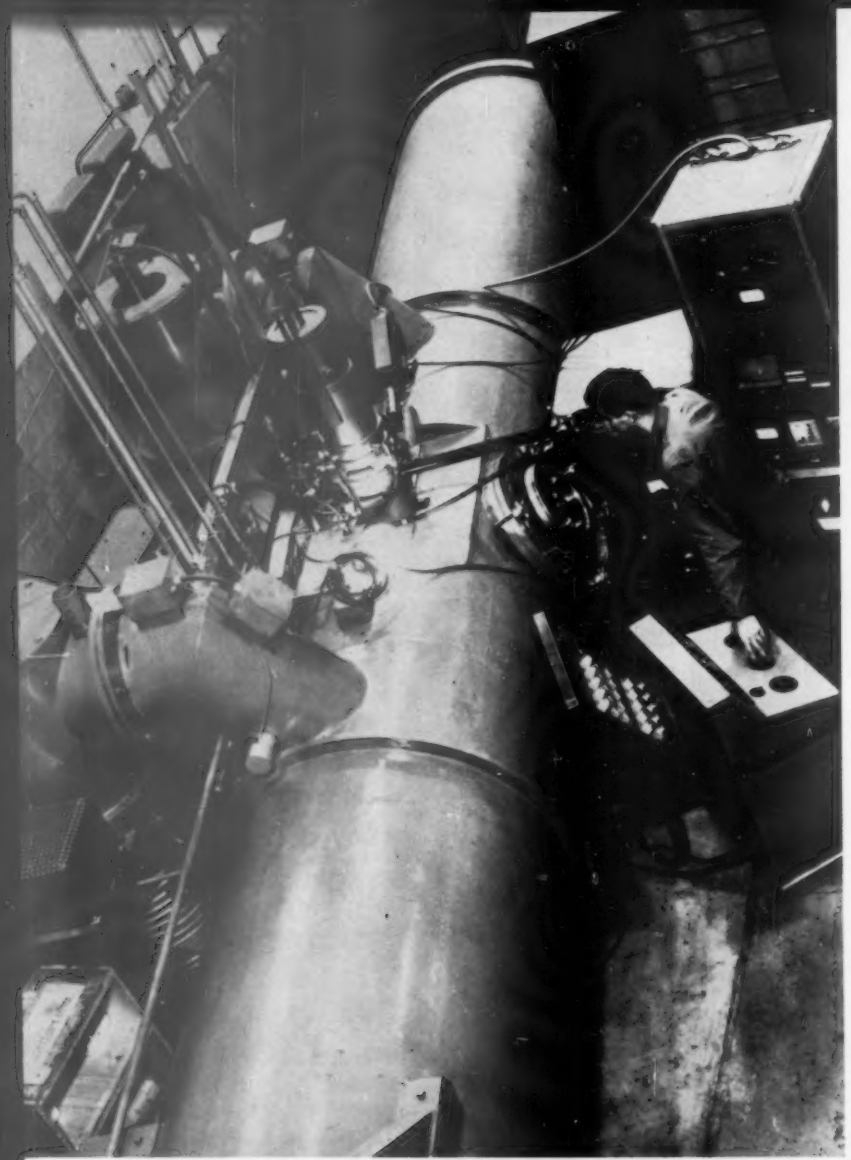


ELECTRON BEAM WELDER has vacuum work chamber that is 28-feet-long and four feet in diameter; the chamber is the largest in the United States.

World's largest electron beam welder makes nuclear fuel elements

IN BRIEF: Westinghouse uses an electron beam machine to weld aluminum-clad nuclear fuel elements; machine makes possible welding to close tolerances with extremely narrow heat-affected and fusion zones.

THE LARGEST electron beam welding system in the world is being used by Westinghouse Electric Corp. They're using it to manufacture aluminum-clad nuclear fuel elements and to join difficult-to-weld metals for their commercial nuclear reactor program.

The special 150-KV electron beam welder was installed by United Aircraft's Hamilton Standard Division. It has a vacuum chamber, where the welding is done, that is 28-feet-long and 4 feet in diameter. The chamber's size allows welding of bigger parts than had been possible in standard electron beam machines.

Westinghouse's Hamilton-Zeiss electron beam machine is located in the commercial development laboratory of the Atomic Fuel Department at Cheswick, Pa. That's where the nuclear fuel elements are made for Westinghouse's testing reactor in nearby Waltz Mill.

HOW ELEMENTS ARE WELDED

The fuel elements are made of uranium alloy plates covered by very thin aluminum sheets. Westinghouse bends them into tubes and welds them longitudinally in the machine's long work chamber. The nuclear fuel is only 0.075 inches away from the weld seam so arc welding cannot be used. Molten metal touching the fuel elements would contaminate the reactor.

Westinghouse's Atomic Fuel Department also uses the machine to weld stainless steel, molybdenum, aluminum and other combinations of metals being used in their commercial nuclear reactor program.

HOW THE WELDER WORKS

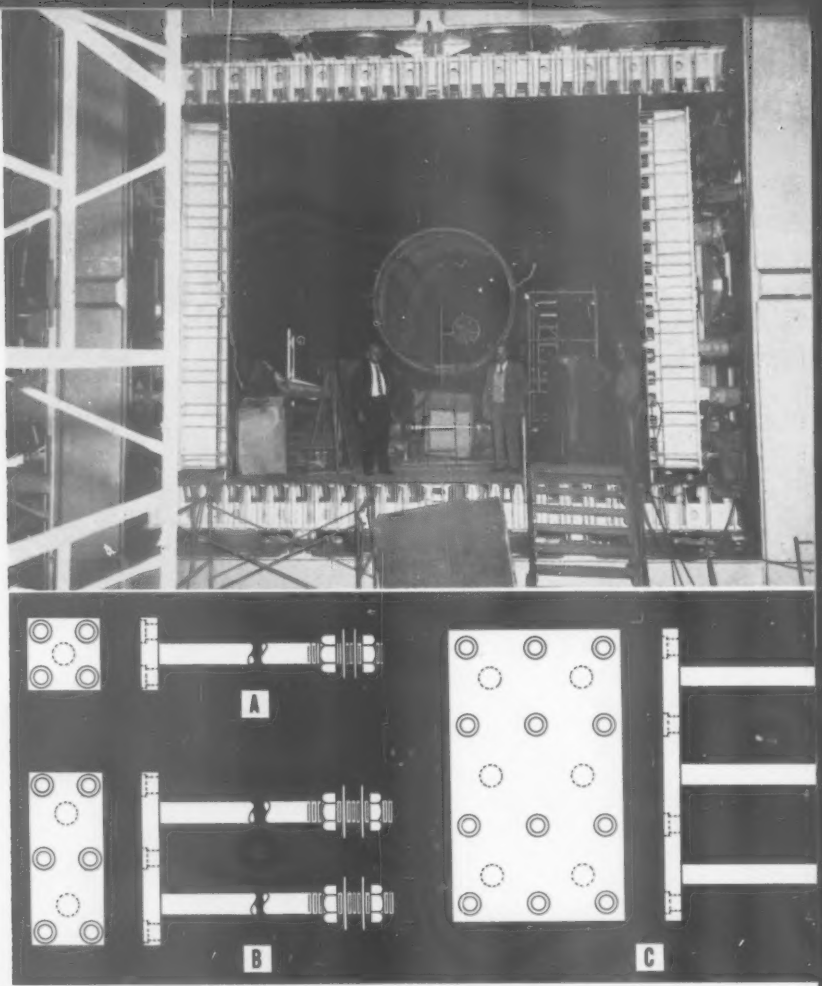
The machine can focus and control a beam of high speed electrons less than 0.010 of an inch in diameter. This permits Westinghouse to weld materials and make close tolerance weldments that are impossible to achieve by any other welding technique. An advanced system of electron optics produces a high beam density. This confines fusion and heat-affected zones to extremely narrow regions. This means there is virtually no thermal distortion.

The machine's electron gun is mounted on the long vacuum chamber. A remote control system positions a work table inside the chamber. This table can be driven longitudinally into the chamber, moved in any of three directions and rotated, depending on the weld configuration required.

The operator monitors the welding operation with a closed circuit television system. • •

the wind tunnel . . .

the welding details . . .



FLEXURE BOLT ASSEMBLIES with one stud (A), two studs (B), and six studs (C) are made by stud welding constructional alloy bolts to mounting pads.

Stud welding solves supersonic problem

IN BRIEF: Stud welded flexure bolt assemblies permit the stainless steel inner side of a wind tunnel's variable geometry diffuser to expand and contract with reference to the outer side.

STUD WELDING played an important role in fabricating a supersonic wind tunnel. It was built at the Air Force's Arnold Engineering Development Center, Tullahoma, Tenn.

After air passes through the test section of the wind tunnel, its energy is recovered by the tunnel's variable geometry diffuser. This section of the wind tunnel is 96-feet long. It's made up of parts that are 21, 20, 16, and 23 feet long. Each of these parts has a stationary top wall and a stationary bottom wall. These walls are 21-feet wide. Each of the five parts has two side walls. They are 16-feet high and can be moved in and out. It is this movement that gives the diffuser the variable rectangular cross section it needs.

UNUSUAL REQUIREMENTS

In making the tunnel's variable geometry diffuser, Pittsburgh-Des Moines Steel Co. used flexure bolt assemblies made by stud welding constructional alloy steel bolts to mounting pads made of the same material. Then they used mild steel studs to fasten these assemblies to stainless steel plate.

The diffuser's four walls are made up of $\frac{3}{8}$-inch Type 410 stainless steel inner sides and mild steel outer sides, with a cellular arrangement of insulation between. The stainless steel inner side must be fastened securely to the mild steel outer side, yet be free to expand and contract with reference to the outer side.

Pittsburgh-Des Moines Steel had a solution which helped them get the job. It was to use flexure bolt assemblies made from constructional alloy steel. The bolts in the assemblies have high strength, but their small diameter ($\frac{5}{8}$ inch) makes them extremely flexible. This means they don't interfere with the expansion and contraction of the inner side.

KSM Products, Inc., Moorestown, N. J., made the flexure bolt assemblies and supplied all other studs for the job. To make the assemblies, KSM first threaded the bolts on one end so they could be bolted to the mild steel outer sides. Then KSM stud welded the bolts to the mounting pads. These pads are used in attaching the flexure bolt assembly to the stainless inner sides. Bolts had to be perpendicular to the pads after welding. The center of each threaded end had to be within 1/32 inch of being directly over the center of the welded end.

KSM made 12,000 flexure bolt assemblies. This means they had to weld 12,000 bolts (in 10 different lengths) to four different kinds of ½-inch thick mounting pads. They welded a single bolt (in six lengths) to a 2-inch-square mounting pad containing four drilled holes. They welded two bolts (in four lengths) to 2- by 4¼-inch pads and two bolts (in three lengths) to 2- by 4¾-inch pads. Finally, KSM welded six bolts (in two lengths) to 4¾- by 8-inch mounting pads with 12 drilled holes.

The mounting pads fit on ⅜-inch diameter mild steel threaded mounting studs that have been welded to the stainless. Nuts draw the flexure bolt assembly tightly against the back of the stainless steel inner side.

Stud welding is ideal for attaching 44,000 of these mounting studs. It is faster and more accurate than other methods. And, it keeps heat input down. This permits using the thinnest stainless possible (⅜ inch) and helps plates meet the flatness requirement, ⅛ inch in 12 feet. • •

For More Information Circle No. 32 on Reader Service Card.

VERSATILE PORTABLE NIBBLERS

. . . CUT METALS* RIGHT ON THE JOB!

No matter the kind of metal or shape to be cut, FENWAY NIBBLERS (air powered or electric) operate with a cutting action which displaces the metal without distortion on both sides of the sheet: insures finished smooth edge, no chipping, no binding, no curling, no flaking . . . Cuts inside circles, squares, odd shaped holes on a per job or production line basis—saves time and materials in every application . . . Portable, light in weight, (8-20 pounds depending on model) —safe, easy to handle, proved durable in critical operations, minimum maintenance, guaranteed unconditionally.

*THE FENWAY NIBBLER CUTS: All non-ferrous metals, copper, brass, aluminum, etc. 10 gauge stainless steel and lighter; 8 gauge mild steel and lighter; tough pitch or asbestos coated corrugated steel ¼" cold or hot rolled steel and 5/16" aluminum.

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FENWAY MACHINE CO. INC.
1910 N. Marshall St., Phila. 22, Pa.

Ranite IS STILL THE BEST!

HAVE YOU COMPARED IT
WITH THE HARD-SURFACING ROD
YOU ARE NOW USING?

IT PAYS TO KNOW!

WRITE FOR INFORMATION OR SEE YOUR RANITE DISTRIBUTOR

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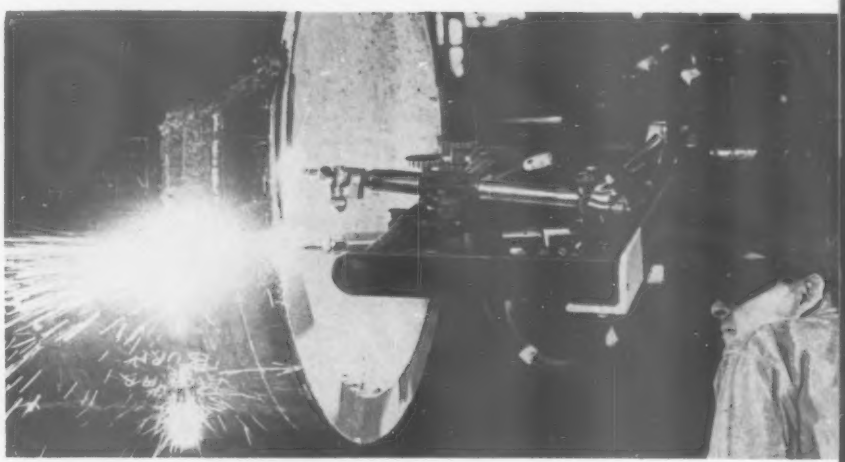
For More Information Circle No. 62 on Reader Service Card.

TRIM: First, the operator trims the immobile cylinder with the cutting torch up and down. He leaves 1/4 inch of metal for machining and welding groove.



TAPER: Now two torches slice inside and outside tapers in the thick vessel wall at the same time. Tapering makes joint edges of thick and thin cylinder halves the same.

Flamecutter trims weld preparation 67%

IN BRIEF: If your cylinders are getting thicker, heavier, and harder to turn, do what Foster-Wheeler did: Make the torches do all the work.

FOSTER WHEELER CORPORATION was unable to rotate large, heavy steel cylinders for flame cutting. So their engineers designed some equipment to rotate the flame cutter around the cylinder.

The cylinders are for marine boiler steam generating equipment. They range from 36 to 64 inches in diameter, and are up to 6-inches thick. For design reasons, they consist of two longitudinal half-sections of different thicknesses, welded together. Before welding on the eliptical ends, the cylinder's edges have to be prepared. First, several inches are cut off the ends. Then the thicker half-section is tapered, inside and out, so that the edge is the same thickness as the thinner half.

Machining proved too costly and time-consuming. Burning looked like a better bet. But it wasn't practical to turn the cylinders on rolls. So Foster Wheeler plant engineers built a portable flame cutter from a modified positioner. This machine moves the cutters around the cylinder. With the new equipment, welding preparation costs have been cut 45%, time 67%.

The positioner has casters for rough positioning, jacks for anchoring and leveling. A cross-slide permits movement of the mast for accurate torch positioning.

Fuel gas and oxygen headers with regulators for cutting oxygen pressure are attached to the base. The headers feed two machine cutting torches and one hand torch. High-speed divergent oxygen nozzles with oxy-propane cutting tips are used. An adjustable torch bar fixture, consisting of a screw counterweight, operator shield, and a pointer for aiming the cutter, is bolted to the positioner's face plate. The positioner also has an electric sweep-second hand for setting cutting speeds, and a locking adjustment for swiveling the mast.

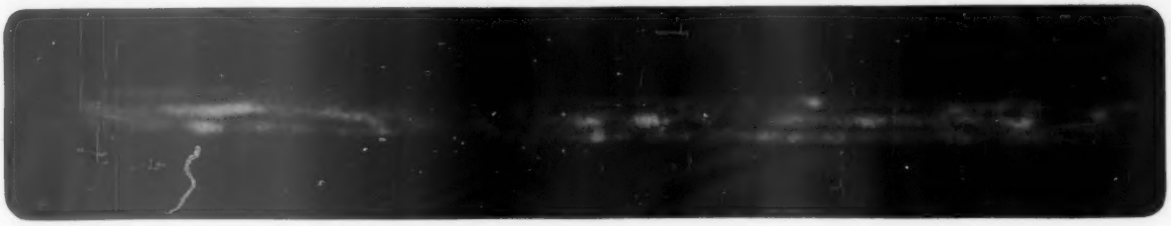
Generator cylinders mount on Vee frames for cutting. A quarter-inch is allowed at each end for final machining of a weld groove. The operator lays out inside and outside tapers, then cut them simultaneously. The tapers have face widths of from two to nine inches, depending on the cylinder diameter and design pressure.

Foster Wheeler reports the quality of the cuts is excellent. They simply knock off the slag, wire brush—and the cut is clean as a whistle. • •

For "X" months under the sea—

every weld must be sound

By use of radiography defective welds are detected and corrective measures can then be taken.



To make sure, Electric Boat, division of General Dynamics Corporation, checks every weld by radiography, using Kodak Industrial X-ray Film, Type AA.

The welded hulls of today's nuclear subs contain a maze of intricate piping, machinery, controls and equipment—much of it welded. Radiography of these welds has helped Electric Boat of Groton, Conn., pile up phenomenal records of dependable performance.

At Electric Boat, every weld that radiography shows to be less than perfect is repaired or replaced. It is the only way to be sure that superb performance will not be marred by a "weak link."

Radiography is a great protector of quality. It can assure the welder and the foundryman that only good work leaves the shop.

If you would like to learn more about radiography in terms of what it can do in your own business, talk it over with an X-ray dealer or write us to have a Kodak Technical Representative call.

Now in the new Ready Pack—Kodak Industrial X-ray Film, Type AA and Type M.

- ☑ No darkroom loading—each sheet sealed in a light-tight envelope.
- ☑ Just place Ready Pack in position and expose—film protected from dust, dirt, light and moisture.
- ☑ In the darkroom—just pull the rip strip, remove film and process.
- ☑ Available also in rolls of 16mm, 35mm, and 70mm widths, 200-foot lengths

EASTMAN KODAK COMPANY
X-ray Sales Division Rochester 4, N.Y.

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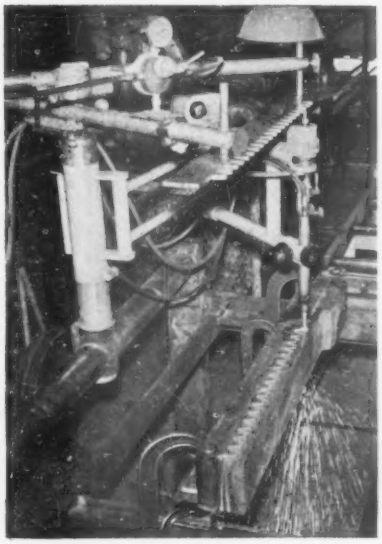
For More Information Circle No. 30 on Reader Service Card.

with a Heath Ultra-Graph

Accuracy lowers production cost



Controlled flame cutting reduced costs on a short run of these large racks

Starting with a rough forging of 8822 alloy steel, 5⅞" deep and 157" long, twenty-one teeth were accurately shaped to close tolerances. In 23 minutes more than 120 lbs. of metal had been removed. The rack was ready for final finishing.

Flame cutting with an Ultra-Graph does not require costly tooling connected with forging. Flame cutting saves many hours of setup and production time over machining when large areas must be removed.

Operating costs are low. With automatic torch lighter and valve manifold the Ultra-Graph lets the operator shut off the torch after each cut to save gas. A press of a button re-lights the torch without readjustment. Once cutting begins the operator is free to clean and prepare for the next cut. It's simple and easy.

Send now for more information on Ultra-Graph application to flame cutting and welding.

HEATH ENGINEERING COMPANY

P. O. BOX 821
FORT COLLINS, COLORADO

Circle No. 39 on Reader Service Card.

REFERENCE DATA *catalogs, handbooks, manuals*

STORAGE AND SUPPLY ADVANTAGES of the new AR3 liquid cylinder for industrial gases are outlined in Form ADC 874A issued by Air Reduction Sales Co. The brochure points out how the relatively lightweight AR3 cylinder is ideal where large, mobile volumes of oxygen, nitrogen, or argon are needed. A detailed specification table presents all pertinent data.

Circle No. 300 on Reader Service Card.

COLD GALVANIZATION by brush, spray, or dip method is explained in a brochure from Galvicon Corporation. The brochure explains that Galvicon is not a paint, but actually a cold galvanizing compound; a coating that combines with the base metal, setting up electrical continuity, and offering true cathodic protection. Suggested uses and methods of application are explained in detail.

Circle No. 301 on Reader Service Card.

PERSONAL PROTECTIVE EQUIPMENT for welding and cutting is featured in 20-page Catalog N-177 from the NCG Division of Chemetron Corp. Described and illustrated are helmets, hand shields, goggles, safety glasses, safety hats and caps, face shields, portable screens, gloves and mittens, and accessories. Included are head, eye, and face safety equipment made by American Optical Co. and distributed by NCG.

Circle No. 302 on Reader Service Card.

TUBE PRODUCTION EQUIPMENT made by McKay Machine Co. is the subject of Bulletin No. 107. The 34-page color brochure describes and illustrates their line of tube production equipment, in all phases, coil handling, strip joining, strip guiding, strip forming, tube welding, oil-cooled rotary transformer, tube finishing, tube cut-off, pipe mills, allied equipment, and replacement rolls.

Circle No. 303 on Reader Service Card.

ELECTRONIC LEAK DETECTORS made by General Electric Co. are the subject of Bulletin GEA-6817A. Eight pages describe GE's Type H line of portable, halogen-sensitive, electronic leak detectors that can be used on welded joints. All detectors are sensitive enough to precisely locate pressure and vacuum leaks as small as 1/100 cu. in./day.

Circle No. 304 on Reader Service Card.

ATMOSPHERIC AIR TORCHES for use with acetylene or propane, along with regulators and a complete line of tips and accessories for heating, soldering, and light brazing, are described in a new, fully illustrated catalog issued by Acetylene Supply Co.

Circle No. 305 on Reader Service Card.

A LIQUID OXYGEN CYLINDER with a capacity of 3,000 cubic feet of oxygen is the subject of Bulletin F-1258 from Linde Company, Division of Union Carbide Corp. Described and illustrated is the LC-3 liquid oxygen cylinder that supplies the equivalent of 12 K-type high-pressure cylinders. Similar cylinders for liquid nitrogen and liquid argon are described.

Circle No. 306 on Reader Service Card.

LIGHT-HEAVYWEIGHT machine tools and accessories made by Rockwell Manufacturing's Walker-Turner Division are featured in a revised 48-page catalog. Some of the industrial tools described are drill presses, grinders, cut-off machines, band saws, and belt and disc surfacers.

Circle No. 324 on Reader Service Card.

FACTS AT YOUR FINGERTIPS: *If you want copies of the catalogs featured on these pages, just circle the appropriate numbers on the bound-in Reader Service Card. We'll do the rest.*

HANDY ALLOY DATA SHEET

HANDY & HARMAN ENGINEERING DEPARTMENT
850 THIRD AVENUE, NEW YORK 22, N. Y.

TEC and TEC-Z

...How to choose between a soft solder and a brazing alloy

Handy & Harman provides *two* alloys that fit between "something stronger than the average soft solder but not as strong as a silver-brazing alloy." They are named TEC and TEC-Z and their flow points are intermediate between soft solders and silver-brazing alloys. Joints made by these alloys are strong in straight tension or shear. For instance, butt joints of cold-worked copper can be made having a tensile strength of about 25,000 psi. This is approximately 10,000 psi. more than can be obtained with tin-lead soft solders. TEC joints retain their strength at elevated temperatures much better than the tin-lead soft solders. As shown in the table below, the strength of the solder itself at 425° F is about the same as a 50% tin–50% lead solder at room temperature in short-time tensile tests.

Applications—One example is a thermostatic bellows where the operating temperature is too high for soft solders (tin-lead), yet requires a joining medium which will not anneal the bellows. Another use is gun parts which require joint strength at higher than soft-solder operating temperatures *plus* corrosion resistance to solutions used in cleaning and blackening. Also for lamp bulb bases operating at approximately 350°-500° F. Automotive applications and heat exchangers. TEC conforms to Government Specifications Mil-S-19234 (Nord); both TEC and TEC-Z are available in sheet, wire, powder, and preforms to specifications.

NOMINAL COMPOSITIONS

	TEC	TEC-Z
Silver	5% plus or minus 0.5%	5% plus or minus 0.5%
Zinc		16.6% plus or minus 0.5%
Cadmium	95% plus or minus 0.5%	78.4% plus or minus 0.5%

PHYSICAL PROPERTIES

	TEC	TEC-Z
Color	White	White
Melting Point	640° F	480° F
Flow Point	740° F	600° F
Density (Troy oz/cu in.)	4.60	4.53
Electrical Conductivity (Cu=100)	22.0%	20.6%
Electrical Resistivity (Microhm-cm)	7.9	8.4

STRENGTH COMPARISON TEC vs. Pb-SN

	TENSILE STRENGTH LBS/SQ IN. TEC	TENSILE STRENGTH LBS/SQ IN. Pb-SN
ROOM	16,400	2,500
300° F	4,400	650
425° F	2,600	Melts
500° F	1,700	

The information and data on this page are available in our Handy Alloy Data Sheet. Ask for "TEC." Handy & Harman, 850 Third Ave., New York 22, N. Y.

Your No. 1 Source of Supply and Authority on Brazing Alloys

HANDY & HARMAN

General Offices: 850 Third Avenue, New York 22, N. Y.

Offices and Plants: Bridgeport, Conn. • Chicago, Ill. • Cleveland, Ohio • Dallas, Texas • Detroit, Mich. • Los Angeles, Calif. • New York, N.Y. Providence, R. I., • Montreal, Canada • Toronto, Canada

DISTRIBUTORS IN PRINCIPAL CITIES

For More Information Circle No. 37 on Reader Service Card.

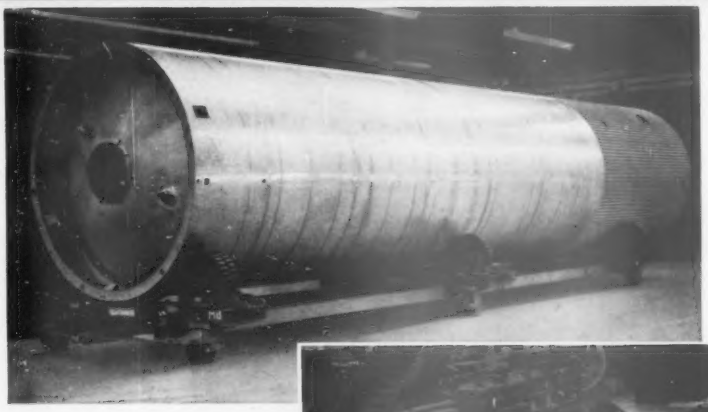
SIGNIFICANT DEVELOPMENTS in constructional steels and newest design concepts for their most effective and efficient use are featured in a new booklet offered by U. S. Steel. "New Steels . . . New Shapes . . . New Concepts . . . Toward More Efficient Steel Design and Construction" is a 28-page compilation of technical data and new ideas arranged as a convenient and compact guide for people who design, fabricate, and build with structural steels.

Circle No. 313 on Reader Service Card.

LEAKPROOF HOSE CONNECTIONS and how to get them with hose clamps made by Punch-Lok Company is the subject of available literature. A complete line of clamps is featured; sizes and prices are given.

Circle No. 61 on Reader Service Card.

PROFITS are built on DEPENDABILITY



For Steady, Positive, Precision Rotation of THIN-WALLED VESSELS use Aronson TRACTRED® TURNING ROLLS

Shown in the photographs above is a good example of an adaptation of Aronson TRACTRED Turning Rolls. Installed on a specially built dollie they become a portable unit that protects thin walled vessels from wrinkling, marring or indenting while being rotated or transported. Cradled in these rubber TRACTREDS, vessels are handled gently dependably with positive, precision rotation. Profits are built on dependability and dependability is built into every Aronson product.

ARONSON BUILDS THE MOST COMPLETE LINE OF POSITIONERS
. . . WITH CAPACITIES RANGING FROM 25 POUNDS TO 600 TONS

Universal Balance® Positioners • Bench Turntable Positioners • Gear Driven Positioners
Headstock-Tailstock Positioners • TracTred® Turning Rolls • Turntables
Fully Automatic Positioners • Geared Elevation Positioners • Magnetic Welding Clamps

Write for detailed engineering data

Quality PRODUCTS by Aronson MACHINE COMPANY, INC.
ARCADE, NEW YORK

For More Information Circle No. 15 on Reader Service Card.

PLASMA GUN SYSTEM and how it can be used to spray coat metals, ceramics, and refractories economically is explained in literature available from AVCO Research and Advanced Development Division.

Circle No. 17 on Reader Service Card.

WELDING SYMBOLS CHARTS available from Lenco, Inc. lists basic arc, gas, and resistance welding symbols and how to use them. Charts are punched for easy insertion in shop notebooks.

Circle No. 45 on Reader Service Card.

HARD SURFACING COMPOUND for use on cutting tools, hammer heads, and drill bits is described in a brochure from Krembs & Company. The brochure explains how Fluxine No. 101 is used to make ordinary cast iron deposits tougher, harder, and more durable and for tempering and hardening carbon steels.

Circle No. 307 on Reader Service Card.

PORTABLE AC ARC WELDERS with a welding range from 10 to 190 amps are featured in Bulletin 190-1 issued by Birdsell Products, an affiliate of Susquehanna Sciences, Inc. The welders are used on 110/220 volt lines, are built to REA and NEMA specifications, and are approved by Underwriter's Laboratories, Inc.

Circle No. 308 on Reader Service Card.

SPOOLED COPPER and copper-base wire for inert-gas welding are the subject of a new bulletin from All-State Welding Alloys Co., Inc. The bulletin gives government specifications, AWS, ASTM, ASME, Boiler and Pressure Vessel Codes on four spooled alloys: deoxidized copper, silicon bronze, aluminum bronze, and phosphor bronze.

Circle No. 309 on Reader Service Card.

SHEAR SELECTION PACKET from Verson Allsteel Press Co. consists of a new 4-page bulletin and a handy slide calculator. Bulletin

VHS-61 gives design details and specifications for Verson's completely redesigned line of hydraulic shears. The slide calculator simplifies the computation of tonnage required to shear all commonly used metals.

Circle No. 310 on Reader Service Card.

PORTABLE FUME COLLECTOR and how it can be used in the welding shop is the subject of literature from Ruemelin Mfg. Co. The unit is mounted on rubber-tired wheels, but is available mounted on steel legs.

Circle No. 311 on Reader Service Card.

CONTROLLED, CONCURRENT heat treating for welding high-performance steels is described in a 4-page bulletin from J. B. Nottingham & Co., Inc. Explained is the company's improved system of safety-engineered plug-in pipe and strip heaters for use on weldments of almost any size or shape.

Circle No. 312 on Reader Service Card.

5 MACHINES IN ONE is the way Lennox Tool and Machine Builders describes their MetlMastr. Literature from the company explains how the machine can be used for shearing, forming, and piercing metal up to 9/32-inch thick.

Circle No. 46 on Reader Service Card.

COMPLETE LINE of pipe clamps made by Jewel Manufacturing Co. is featured in catalog. Described and illustrated are conventional pipe clamps; elbow, angle, and flange clamps; and pipe markers.

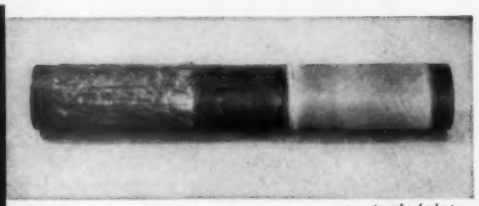
Circle No. 79 on Reader Service Card.

BRAZING ALLOY REFERENCE chart listing metal compositions, density, and melt and flow temperatures for Silvaloy silver brazing alloys (37 compositions) and Engaloy precious metal brazing alloys (19 compositions) has been published by the American Platinum and Silver Division of Engelhard Industries, Inc.

Circle No. 314 on Reader Service Card.

How flame spraying can pay for itself in your shop in a very short time

ONE EXAMPLE
Hard facing time cut from 4 hours to 25 minutes



unretouched photo

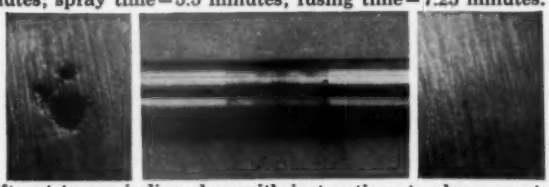
The two end sections of this shaft have been built up with AMS 4775. Section at left applied by welding – time 4 hours; section at right by flame spraying – time 24 minutes, 45 seconds.

QUESTION: Look at the picture. Which end would you prefer to grind finish?

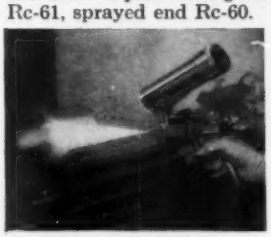
Here's the whole story. We took a 15″ length of 2.5″ mild steel shafting and undercut two 5″ sections .050″ on the radius. We then sent the shaft to a nationally-known job shop with instructions to apply AMS 4775 on the left-hand section, sufficient to finish at 2.5″. Weight of welded-on alloy was 17 9/16 ounces – time spent by one of their top men – 4 hours (including preparation).

Then we blasted the second section with steel grit and flame sprayed it with AMS 4775 in powder form (ThermoSpray Powder 15E). The coating was then torch-fused. Weight of deposited alloy – 11 5/16 ounces; surface preparation, set-up and pre-heat – 12 minutes; spray time – 5.5 minutes; fusing time – 7.25 minutes.

Unretouched photo, in center, shows finish-ground shaft. Insets, magnified about 50X, show pits in welded section (left) and no pits in flame sprayed section at right.



We then sent the shaft out to a grinding shop with instructions to clean up at 2.500″ plus. The flame-sprayed section cleaned up at 2.510″ but welded section still showed pits when grinding was stopped at 2.477″ Rockwell of welded end Rc-61, sprayed end Rc-60.



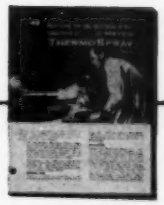
Pump plunger being flame sprayed with METCO ThermoSpray® Powder Gun

These flame-sprayed coatings are solid, homogeneous; usually superior to those applied by other methods. You can apply them at high speed, with lower material and finishing costs. In addition to AMS 4775, a number of other powders – including tungsten carbides – are available for various service requirements; all may be fused–some used as sprayed for certain service requirements.

For further information on this high-speed, money-saving, hard-facing process, phone, write or wire.

METCO INC.
FORMERLY METALLIZING ENGINEERING CO., INC.
Flame Spray Equipment and Supplies

1179 Prospect Ave., Westbury, L. I., N.Y. Telephone: Edgewood 4-1300 Cable: METCO
In Great Britain: METCO., Ltd., Chobham-near-Woking, England



FREE BULLETIN

FREE BULLETIN: Send off the coupon for this and other useful information which shows how flame spraying pays for itself–in a very short time. No obligation, of course.

METCO INC.
1179 Prospect Ave., Westbury, L. I., New York

Please send me information on hard-facing by flame spraying.

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Title _____

Company _____

Address _____

City _____ Zone _____ State _____

For More Information Circle No. 52 on Reader Service Card.

CONTROLLED ANGLE TORCH for tungsten inert gas arc welding is the subject of a bulletin from the Falstrom Company. The bulletin explains in detail how the torch angle can be changed at will, how the tip can be extended into hidden recesses, and how the torch can be double back 180° into impossible-to-reach corners. Complete specifications are given.

Circle No 315 on Reader Service Card.

RESISTANCE WELDING machines, electrodes, and accessories are described and illustrated in literature from Eisler Engineering Co., Inc. Specifications and operating details are given.

Circle No. 316 on Reader Service Card.

PROTECTIVE CLOTHING and equipment for welding operators are featured in Catalog W-54 issued by Safety Clothing and Equipment Co. Described and illustrated are gloves, sleeves, jackets, bibs, overalls, leggings, and spats.

Circle No. 317 on Reader Service Card.

ACCESSORIES for the arc welding circuit are featured in Form MSA-1962 issued by Tweco Products, Inc. Described and illustrated are tapered screw-type Twecolugs; jacket-stripping and cable-cutting hand tools; replacement machine plug-in, blanks, and adapters; and a cable strand deoxidizing compound. Specifications and prices are given.

Circle No. 318 on Reader Service Card.

AXLE ASSEMBLIES, trailer undercarriages, farm and trailer jacks, implement and trailer couplers, and spindle end assemblies are described and illustrated in Catalog 18-R issued by Hammer Blow Tool Co. Specifications and design details are given.

Circle No. 36 on Reader Service Card.

TUNGSTEN CARBIDE hard surfacing materials and how to apply them is the information given in 8-page illustrated Bulletin B-175A available from Kennametal, Inc. Four forms of Kennametal hard surfacing materials are covered, powders, which are sprayed on, and rods for application by arc, tungsten-arc, or oxy-acetylene processes.

Circle No. 319 on Reader Service Card.

A CUT-OFF MACHINE that delivers 15 hp to the spindle is the subject of literature from Stone Machinery Co., Inc. Described and illustrated is the M-160 cut-off machine which can be used manually, semi-automatically, or full-automatically on large solids and shapes. Complete specifications and design details are given.

Circle No. 69 on Reader Service Card.

ARC WELDED FABRICATION of an adjustable boat lift is one article in No. 166 of Hobart Brothers Company's Arc Welding News. This 24-page booklet de-

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FIVE KEY WHOLESALERS SPEED DELIVERY OF G-E TUNGSTEN ELECTRODES

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Now you can get the G-E Electrodes you want *when* you want them. Five conveniently located wholesalers in major welding markets provide immediate delivery of Pure Tungsten, 1% Thoriated Tungsten and 2% Thoriated Tungsten Electrodes. *Attention Distributors:* No more waiting for shipments from Cleveland. Contact the wholesaler that's nearest to you for fast service. General Electric Co., Lamp Metals & Components Dept. WDF-111, 21800 Tungsten Rd., Cleveland 17, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For More Information Circle No. 33 on Reader Service Card.

scribes and illustrates interesting and unusual production and maintenance welding done with Hobart arc welding machines and electrodes.

Circle No. 320 on Reader Service Card.

CLAMPS in a size and pattern for every job are the subject of a catalog from Cincinnati Tool Co. Described in detail is a welding clamp that has a spatter-resisting solid alloy screw, has drilled frame for grounding, and comes in regular, deep-reach, and heavy-duty models.

Circle No. 23 on Reader Service Card.

ACCESSORIES FOR ELECTRON microscopy are featured in a catalog from Ernest F. Fullam, Inc. Described and illustrated is a complete line of accessories for use with electron microscopes.

Circle No. 321 on Reader Service Card.

"THE HOW AND WHY of Certifying Synstron Semiconductors is discussed in a new bulletin (200) available from the Semiconductor Division of Syntron Company.

Circle No. 322 on Reader Service Card.

BRAZING STAINLESS STEEL is the story told in *Brazing News* No. 85 issued by Handy & Harman. Case histories describe in detail how different companies braze stainless steel products.

Circle No 323 on Reader Service Card.

GAS REGULATORS for the accurate control of industrial gases in all applications are featured in a 40-page catalog issued by Air Reduction Sales Co. Form ADC 705G provides quick-reference charts which indicate the range and variety of Airco regulators.

Circle No. 325 on Reader Service Card.

ANYBODY'S PRIVILEGE

You may request more data on any item in this magazine that has a Reader Service Number regardless of whether or not you are the subscriber to whom the magazine was addressed.

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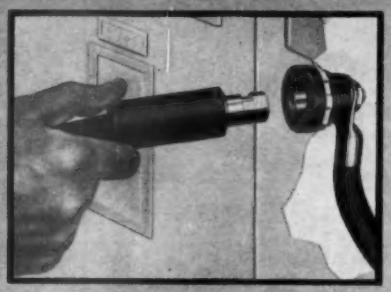

cam-lok

POWER CONNECTIONS

"The Standard of the Welding Industry"

CAM-LOK is standard equipment on various welding machines manufactured by . . .

- Hobart
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- Westinghouse
- Harnischfeger
- Nelson
- Forney
- Omark-Graham
- KSM Prods.
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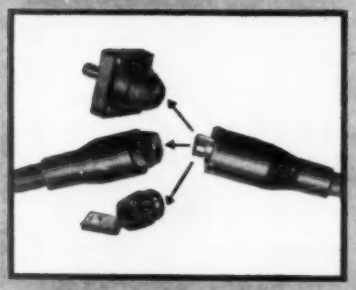
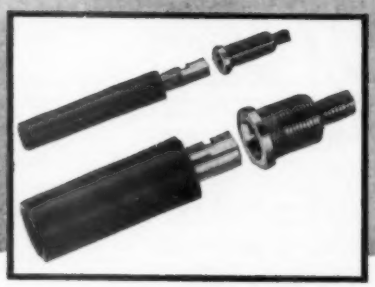
- Bren-Weld
- Birdsell Prods.
- Vacuum Tube Prods.

. . . and many others





Modern power distribution in the welding industry demands a fast, high pressure positive connection with minimum resistance that is rugged, simple and economical. And leading welding machine manufacturers build Cam-Lok connections into their equipment for safe, full power distribution.

Make a better connection now with Cam-Lok, and speed up your production. Write for complete line catalog on plugs, connectors, and receptacles or detail your special requirements.

cam-lok DIVISION

EMPIRE PRODUCTS, INC., 9213-D BLUE ASH RD., CINCINNATI 42, O.

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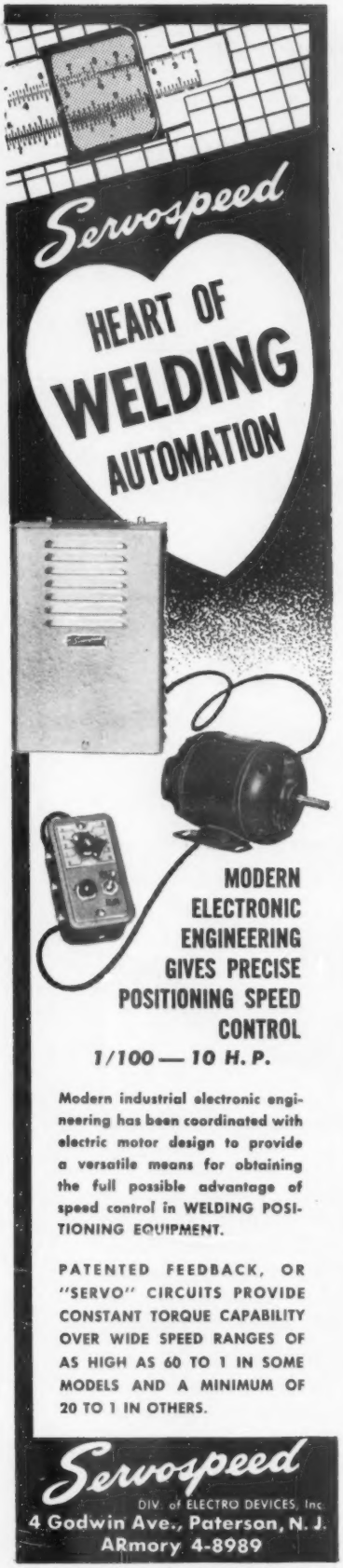
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GIVES PRECISE
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Modern industrial electronic engineering has been coordinated with electric motor design to provide a versatile means for obtaining the full possible advantage of speed control in WELDING POSITIONING EQUIPMENT.
PATENTED FEEDBACK, OR "SERVO" CIRCUITS PROVIDE CONSTANT TORQUE CAPABILITY OVER WIDE SPEED RANGES OF AS HIGH AS 60 TO 1 IN SOME MODELS AND A MINIMUM OF 20 TO 1 IN OTHERS.
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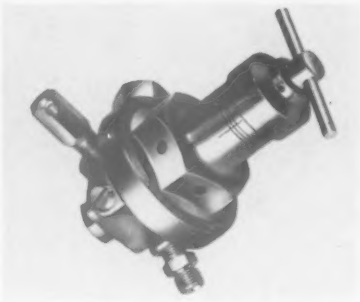
Circle No. 64 on Reader Service Card.

NEW PRODUCTS



Gaugeless Regulator

An accurate, sturdy, metal gaugeless regulator, for use with most pressurized liquids and gases, is offered by Dockson Corp. Available in single stage (#6) and double stage (#261) models, the new regulators are considerably less prone to damage than glass-faced regulators. Bonnet and body are forged brass. Tested and calibrated adjustment scales are etched on the bonnet for easy reading. Tank pressure is shown by a damage-proof indicator rod which slides inside a hex plug.

Circle No. 27 on Reader Service Card.

Temple-Mounted Side Shields

A new plastic side shield, permanently attached to temples, is available for Multi-Fit bridge safety glasses. The Fendell Co. made the development to give side and better front protection with practically no more weight. Shields come clear or green and fold flat when glasses aren't used. Either color may also be obtained on cable-type temples.

Circle No. 200 on Reader Service Card

Production-Line Plasma Gun

A new compact, lightweight gun, called Plasmagun, has been announced by Avco Corporation's Research and Advanced Development Division. The 5-inch-long, 3½-pound gun is a practical, versatile production tool that is simple and reliable. Gun assemblcs with only four bolts securing precision machined, self-aligning, piloted parts. All parts, including cathode and anode, are covered by Avco warranty.

Plasmagun will spray coatings—including refractories—with controlled thickness, density, and bond strength. It deposits coatings at twice the speed of comparable competitive models, and at savings up to 30 percent over other coating processes, says Avco.

The new gun has adjustable cathode control and high regulation of powder feed. This permits the use of powders formerly too fine for plasma guns. The complete Plasmagun system includes gun, control console with powder feed, a power supply, and spray booth.

Circle No. 17 on Reader Service Card.

Long, Flexible Torch

A controlled angle torch with a 9-inch-long flexible body of molded neoprene has been announced by Falstrom Company. Said to be the longest flexible Tig torch in the world, the new 9-incher is capable of reaching hard-to-get-at recesses and angles.

Circle No. 201 on Reader Service Card.

Seamer

The CayugaMatic seamer manufactured by Cavuga Machine & Fabricating Co., Inc. has two self-supporting stanchions that make the machine very portable and easily set up. The seamer's carriage moves 8 to 120 ipm on a sturdy, square-tubing track. The machine can be used for welding and/or cutting on sloping and vertical surfaces as well as in a horizontal plane.

Circle No. 202 on Reader Service Card.

the fastest, safest and surest way to... a Leakproof Hose Connection

See Your Distributor or write direct for catalog and prices

The Sign of a GOOD Hose Clamp

PUNCH-LOK Company

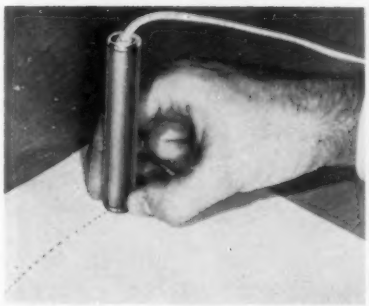
Dept. X, 321 N. Justine St., Chicago 7, Ill.

Circle No. 61 on Reader Service Card.

Flux-Coated Brazing Rod

A new non-charring, chip-resistant, micro-ground flux has been extruded on standard brazing alloys by All-State Welding Alloys Co, Inc. All-State Nos. 11, 13, and 41 for nickel silver brazing, build-up, and general purpose brazing—are the coated products. The new coating, with unlimited shelf life, is undamaged by normal handling.

Circle No. 229 on Reader Service Card.



Impulse Recorder

A new, easy-to-use instrument, the CXC impulse recorder, that accurately records impulses of electrical equipment for a visual check, has been developed by Continental X-Ray Corp. Spot welders and particularly users of x-ray equipment benefit by using the CXC to eliminate taking and developing actual "spinning top" radiographs in order to check or set the radiographic timer.

Electric impulses are recorded as it is moved over the paper. Impulse marks at the rate of 120 per second are then counted to determine exact time. The practical range of the recorder is for times from 1/60 to two seconds. The writing element is easily replaceable.

Circle No. 230 on Reader Service Card

Beryllium Copper Filler Materials

Using beryllium copper as the filler material on critical welding applications joining beryllium copper plate or rod or welding other materials such as stainless, medium carbon steel, inconel, or copper to beryllium copper, has been developed by the Beryllium Corp. The development of the technique of using beryllium copper as a welding material, along with Berylco beryllium copper plate will make possible the wider use of beryllium copper in applications such as pressure vessels, wind tunnel nozzles, cryogenic vessels, and machine fabrications.

Circle No. 231 on Reader Service Card.

NEW! WYPO FILE FREE!

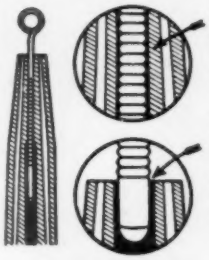
NEW POLISHED ALUMINUM CASE DESIGNED TO SERVE AS HANDLE FOR THE NEW FILE

Let Your Local Welding Supply Dealer Explain Why "YOU GET SO MUCH MORE" With . .

WYPO
Wipes and Polishes *the World's Finest*
CUTTING & WELDING TIP CLEANERS

FREE! NEW, SPECIALLY DESIGNED WYPO POLISHING FILE INCLUDED IN EACH SET

More Exclusive WYPO Features



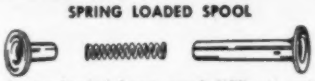
These rounded outer edges of cleaning ridges clean and polish tip orifice without scratching or cutting.

This smooth pilot guides WYPO Tip Cleaner into tip. Will not enlarge or damage tip port.

This cross section view of WYPO Cleaning Surfaces shows these exclusive features: Rounded cleaning surfaces that won't jam or cut.

Straight sided valleys insure thorough cleaning by removing all waste.

SPRING LOADED SPOOL



Spring loaded brass spool. Will not rust. Holds cleaners securely in case.

DOUBLE WOUND EYES

Insures longer life for small sizes of WYPO Tip Cleaners. Will not pull out of case.

STAINLESS STEEL POLISHING FILE

Specially designed WYPO File furnished free in each set

NOW AVAILABLE IN 3 CONVENIENT SETS

WYPO TIP CLEANERS
STANDARD SET

CLEANER NO.	FOR DRILL
7	73-74
8	73-72-71
10	70-69-68
12	67-66-65
14	64-63-62
15	61-60
16	59-58
17	57
18	56
22	55-54
24	53-52
26	51-50-49

S. S. WYPO FILE MADE IN U.S.A. PAT. NOS. 2420501, 2473750 IN CANADA 1948

STANDARD SET OF (12) Cleans (27) Drill Sizes Nos. 73 to 49 Incl.

WYPO TIP CLEANERS
JUMBO SET

CLEANER NO.	FOR DRILL
28	48-47
30	46-45
31	44-43
34	42-41
37	40-39-38
39	37-36
42	35-34-33
44	32-31
45	30

S. S. WYPO FILE MADE IN U.S.A. PAT. NOS. 2420501, 2473750 IN CANADA 1948

JUMBO SET OF (9) Cleans (19) Drill Sizes Nos. 48 to 30 Incl.

MASTER SET
WYPO TIP CLEANERS
PAT. NOS. 2420501, 2473750 IN CANADA 1948

CLEANER NO.	FOR DRILL
7	73-74
8	73-72-71
10	70-69-68
12	67-66-65
14	64-63-62
15	61-60
16	59-58
17	57
18	56
22	55-54
24	53-52
26	51-50-49
28	48-47
30	46-45
33	44-43
34	42-41
37	40-39-38
39	37-36
42	35-34-33
44	32-31
45	30

S. S. WYPO FILE MADE IN U.S.A.

MASTER SET OF (31) Cleans (46) Drill Sizes Nos. 75 to 30 Incl.

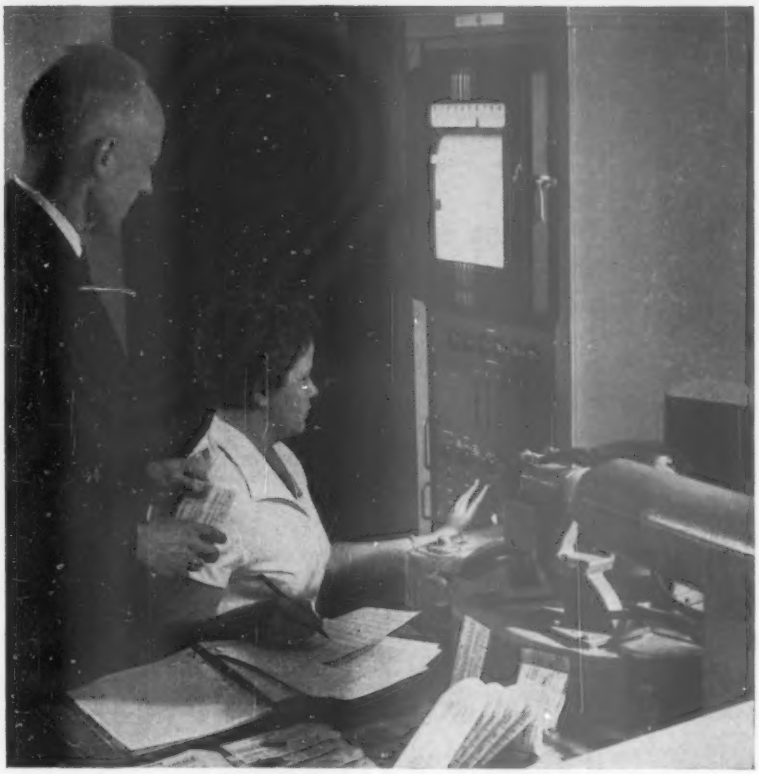
Replacement cleaners and files available. Cleaning Range— Cleaner No. & Drill Nos. stamped on back of each case. WYPO GIVES YOU MORE!

SOLD BY LEADING WELDING SUPPLY DEALERS

MAITLEN AND BENSON, INC.
1395 Obispo St., Long Beach 4, Calif.

Circle No. 50 on Reader Service Card.

BETTER WELDING THROUGH ARCOS QUALITY CONTROL



X-ray Emission Spectrograph shows analysis of Arcos weld metal

Predictable performance of Arcos weld metal results from strict adherence to uncompromising standards. The program of rigid quality control of filler metal products enforced by Arcos is comprehensive and far-reaching. Every phase in production is subjected to constant inspection. Modern testing instruments provide highly accurate analysis of materials and weld metals. Rigid quality control assures predictable performance of Arcos filler metal products.

ARCOS

Arcos Corporation • 1500 S. 50th St. • Philadelphia 43, Pa.

For More Information Circle No. 11 on Reader Service Card.

Gamma Ray Unit

A 150-curie mobil Cobalt unit that can be used for directional or panoramic industrial inspection has been introduced by Picker X-Ray Corp. The unit, Tech Ops Model 520, is ideal for steel fabricators and foundries in high production radiography of heavy sections. Exposure time is only 7 percent of that required with a 10-curie source.

Removal of a plug in the source container and adding guide tubes adapts the normally directional unit to panoramic work. The source then can be cranked out by remote control. Safety locks and warning lights insure complete safety.

Circle No. 203 on Reader Service Card.

Cutting Machine

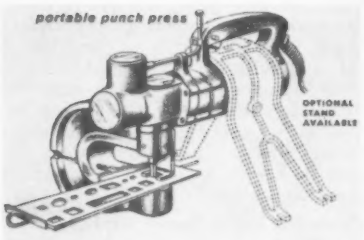
A Series 1510 cutting unit is the newest machine offered by Wallace Supplies Mfg. Co. The machine will cut solid rounds to 6 inches in most steel alloys in about 3 seconds per square inch. Unit features power feed and power oscillation. With proper work holding fixtures channels up to 10 inches can be cut. Units are available with 18, 20, and 26-inch wheels. A similiar machine series for wet cutting covers the same wheel sizes plus a 34-inch diameter. The Series 1510 makes exceptionally high-quality, smooth cuts.

Circle No. 204 on Reader Service Card.

Welding Power Pack

A new power pack for multiple spot welding with high production of small weldments has been announced by Ampower Products. Composed of two or more dependent high output water-cooled transformers, the compact unit (Model 60-T) offers single cycle operation of one or more spots in rapid sequence. Power supply required is 220-250 volts, 60 cycle, single phase; maximum output is 10 kva per transformer. Housing measures 20 inches square.

Circle No. 205 on Reader Service Card.



Portable Punch Press

A 3-ton punch press that weighs only 17 lbs. has been announced by Modern Mfg. Co., Inc. Called Porta-Press, unit punches round, square, rectangular or any shape hole up to ⅞ inch diameter, with easily replaced punches and dies, in $\frac{1}{16}$-inch aluminum or ⅛-inch steel.

Circle No. 206 on Reader Service Card.

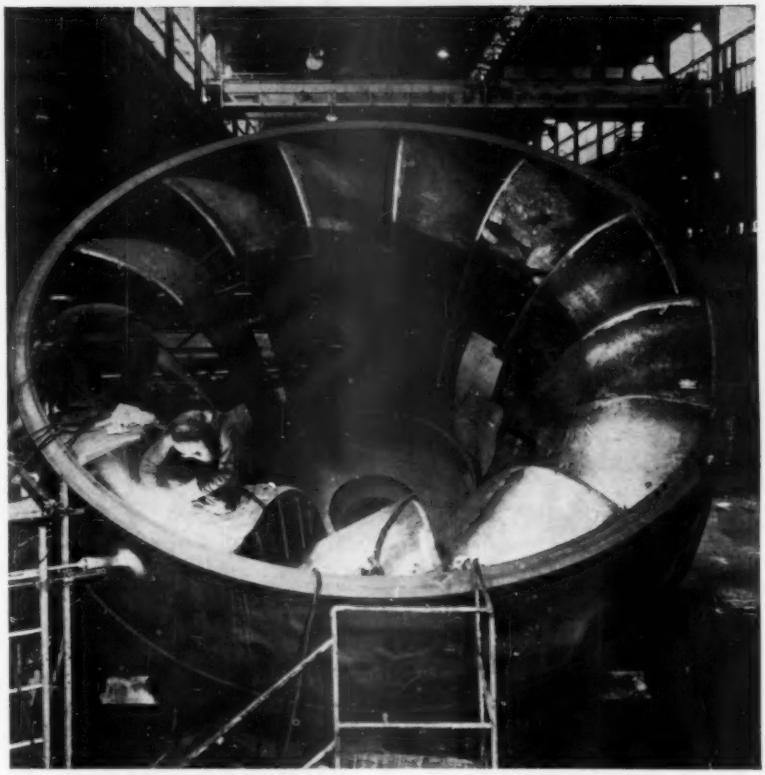
Structural Shape Clamp

Two new clamps, designed for sure-grip handling of I beams and structural shapes, have been announced by J. C. Renfroe & Sons, Inc. Model STL has automatic release which enables the crane operator to release the clamp without help from the ground. Model ST will handle structural shapes but doesn't have the automatic release.

Both clamps have a gripping ratio of 3¾ to 1. They are made of high-grade heat-treated tool steel and have a safety factor of 5 to 1 overload rating. Clamps come in various capacities and jaw openings.

Circle No. 207 on Reader Service Card.

WELD WITH ARCOS STAINLESS ELECTRODES



Job Report Courtesy of Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin

Hydraulic turbine runner blades overlaid to resist cavitation. To protect the blades of this huge hydraulic turbine runner from the destructive effects of water wear, Arcos stainless rods were selected for overlaying critical areas. The precise chemical and metallurgical properties of Arcos stainless rods—assuring uniform, predictable results—make this process both dependable and economical. Meet your stainless welding requirements with Arcos—the most complete selection available anywhere.

ARCOS

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For More Information Circle No. 12 on Reader Service Card.

SPECIAL MONEY-SAVING OFFER!

For Light Welding & Cutting:

NEW PUROX 100 ONE HUNDRED OUTFIT

$114.62 value for only $100.00

YOU SAVE $14.62!

Ideal for light-duty production, repair, maintenance work. Use the PUROX "100" oxy-acetylene outfit on aircraft, small parts, light machinery, sheet metal assemblies. Pocket-sized regulators and compact torch make it extra small, portable (entire unit weighs less than 10 lbs.). Welds up to 3/8", cuts up to 2". Additional heads and nozzles available to extend range. Elimination of metal-to-metal gas seals adds years of useful life.

For Medium Welding & Cutting:

NEW PUROX 130 ONE-THIRTY OUTFIT

$148.07 value for only $130.00

YOU SAVE $18.07!

Meets any shop's medium-range oxy-acetylene needs . . . on production lines, in garages and repair facilities, on pipe welding jobs, in tool, die, maintenance departments. *Easy to use*—no need to readjust regulators when you switch jobs. *Reliable*—flame won't sputter or pop regardless of size, valve-throttle or regulator settings. Lightweight, easily portable, economical to buy and use. Welds up to 3/8", cuts up to 4".

Your LINDE Distributor — Where One Call Gets It All

Your nearby LINDE distributor has both these PUROX kits in stock now. For his location, check your Yellow Pages or write Linde Company, Division of Union Carbide Corporation, 270 Park Ave., New York 17, N. Y. *In Canada:* Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

LINDE COMPANY

UNION CARBIDE

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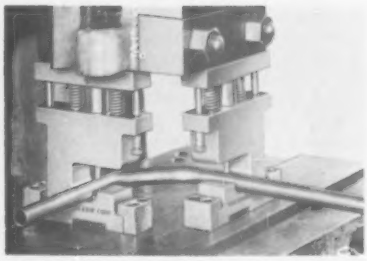
For More Information Circle No. 48 on Reader Service Card.



Piercing Units

The Vogel Tool & Die Corporation makes a unit, called Perf-Arc, that singly or in a gang, can pierce holes in straight or curved tubing, flats, angle iron, and other shapes. Units cut setup time and tooling cost through their adaptability. They can be mounted flush with each other or separated, or at right angles to each other. Bushings and perforators for each unit come in many sizes and are interchangeable.

Circle No. 208 on Reader Service Card.

Welding Helmets

Several new fiber glass helmets have been added to the American Optical Company's Safety Products Division welding helmet line. The company manufactures two types of wide-vision welding helmets: Curved-chin and straight bib. Both have a wide-vision lens cell. Other new line additions: Narrow-front shell with top, bottom and side flanges and a straight bib fiber glass. Both come with a stationary or lift-front plate holder.

An all-plastic headgear is also new. It's designed to fit better and has self-locking size adjustment.

Circle No. 209 on Reader Service Card.

Plumbers Furnace

An LP-Gas furnace, in tank top or floor model, has been developed by Wemco Products. Unit can be used

for melting lead, asphalt, tar, babbit, paraffin, etc. The furnace will handle a pot 9 inches in diameter, will operate on full tank pressure or with a regulator.

Circle No. 210 on Reader Service Card.

Hardsurfacing Electrodes

Rankin Manufacturing Co. has announced a new length for their 3/16 and 1/4-inch Ranite A and BX hardsurfacing electrodes. The wear-resisting rods formerly came in 18-inch lengths in only the 5/16-inch diameter. Tests have shown the need for the new length in small diameters.

Circle No. 211 on Reader Service Card.

Safety Glasses

Safety glasses, designed to fit 90 per cent of all workers, are offered by Chicago Eye Shield Co. Feature: Extra-thick Polyfit nose bridge. Plastic frames are green, flesh, or mahogany. Temples are Rhodium-plated for corrosion resistance. Choice of vinyl-coated cable of spatula ends. Welded hinges hold temples securely to the frame. F-7 Shape 6.00C super Safety Lenses—in clear or anit-glare glass or plastic.

Circle No. 212 on Reader Service Card.

Reinforced Wheel

A new 3-ply, type 28 hat wheel, called Topper, is a product of the Geo. H. Bullard Co., Inc. The Topper's bonded-on ⅝-11 hub eliminates the need for special adaptor kits and assemblies. The wheel cuts smooth, easy, and fast—and it lasts. It is designed for use with air or electric portable grinders that turn at least 5,200 rpm. Wheel sizes: 7¼ and 9¼ inches.

Circle No. 213 on Reader Service Card.

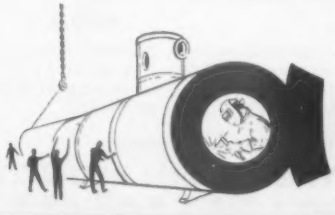
Specialists in Welded Design

STEEL FABRICATING

TANK MANUFACTURING

Specialists in { STAINLESS STEEL, ALUMINUM, HIGH TENSILE STEEL, MONEL METAL, CARBON STEEL }

ASME Code Pressure Vessels, Lined Vessels (Rubber, Plastic, Lead)



over a half century of service

ART WELDING COMPANY, INC.

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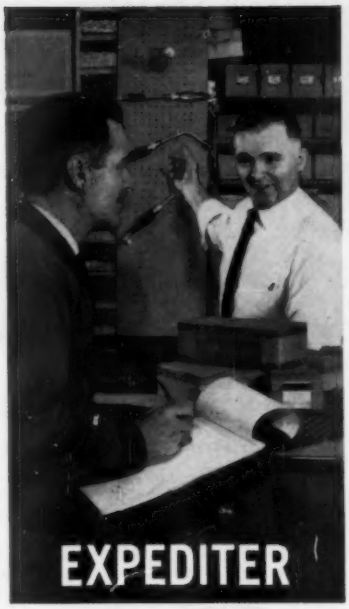
For More Information Circle No. 16 on Reader Service Card.



—your LINDE distributor!

Time is money, and your LINDE distributor is the man to save you a lot of both. He maintains complete stocks of equipment. They're top in quality—the LINDE brand name is your assurance of that. Whether it's for welding and cutting apparatus, industrial gases, welding rods, supplies, or accessories—you can count on your LINDE distributor to deliver what you want *fast*.

What's more, he can back up this service with sound, knowledgeable advice on welding and cutting. He's a welding supply specialist, an independent local businessman—*it's his business to know your business.* And for extraordinary problems, he can draw on LINDE's exceptional technological services which have been built on more than 50 years of pioneering in welding.

A phone call from you is all it takes to enlist his services. Look up your LINDE distributor in the classified directory, or write for his address to Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada,* Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

Your LINDE Distributor

"Where One Call Gets It All"

LINDE COMPANY UNION CARBIDE

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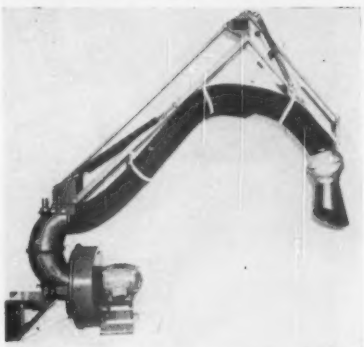
Circle No. 49 on Reader Service Card.

Circle No. 21 on Reader Service Card.

Remove Welding Fumes



Keep shop clean. Improve operators' production efficiency. Wherever there's smoke or fumes, — up, over or into your work — this Exhauster quickly and safely gets rid of them at surprisingly low cost. Standard sizes, 9-ft. and 15-ft.; extended sizes available per your specifications.

EXCLUSIVE FEATURES

Write For Free Catalog

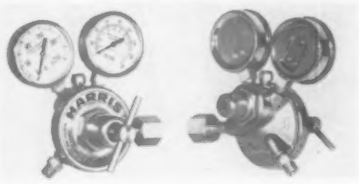
BLOWERS, INC.

12655 S. Western
Blue Island, Illinois

Gouging And Piercing Electrodes

Aufhauser Brothers have developed electrodes, called Groovees to simplify gouging and piercing of mild steel, cast iron, stainless steel, and nonferrous metals. Groovees do not require oxygen or air; they can be used with a. c. or d. c. power without other attachments; they leave a clean scale-free surface; and they avoid carbon pick-up. Groovees come in 1/8 and 5/32-inch diameters.

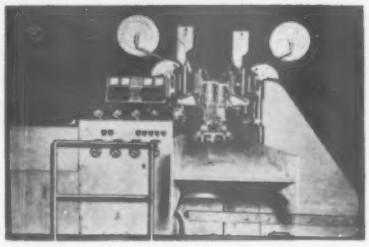
Circle No. 214 on Reader Service Card.



Multi-Stage Regulators

A new line of Multi-Stage Regulators has been introduced by Harris Calorific Company. Feature: Accurate and infinitely adjustable first stage delivery pressure that minimizes variation from static to flowing pressure. This enables the second stage to control constant flow accurately as the cylinder pressure reduces. Harris Model 92-3 Regulators vary less than a half pound from the original setting, regardless of decreasing inlet pressure. Models are available for all commercial gases.

Circle No. 215 on Reader Service Card.



Automatic Profile Welder

A new machine, capable of producing beams of various profiles by automatic welding, is being marketed by Pullmax AB, Gothenburg, Sweden. I-beams, U-beams, and T-profiles are fabricated from desired plates to any length and width. The welder can also be adapted to weld tubes. It consists of the feeder and two or four automatic submerged arc weld-

If your metal sawing requirements are many and varied . . . if you have to cut the smallest, most delicate work or heavy solids up to 18"x18" . . . if you cut-off bar stock, pipe, tubing, moulding or structural shapes—then this MARVEL No. 8 Band Saw is the machine for you.

Not only is the MARVEL No. 8 Band Saw a truly universal machine capable of handling virtually any metal sawing job, but it does its work with unmatched efficiency, economy, and ease of operation. Many exclusive No. 8 Band Saw design and operating features such as vertical column design, control tower visibility, column and blade tilting to any angle up to 45° right or left of vertical for cutting at an angle or miter, are described in Bulletin 875. Write for it today. If you'd like a demonstration, mention the fact in your inquiry, and we'll arrange it at your convenience.

ARMSTRONG-BLUM MFG. CO.
5700 West Bloomingdale Avenue, Chicago, U.S.A.

For More Information Circle No. 13 on Reader Service Card.

Weld the Best Hard-Surfacing Alloys—FAST!

Spray on hard-surfacing alloys that fuse into long-wearing welded overlays. The Colmonoy Spraywelder applies highest quality nickel and cobalt base Colmonoy hard-surfacing alloys (eight grades). They produce abrasion and corrosion defying overlays that are uniform and readily finished.

The Spraywelder applies metallizing coatings too. Use Colmonoy C-290 Powder (to rebuild crankshaft bearings) and other common metal powders.

Now made in two capacities:

MODEL D

High capacity of over 12 pounds per hour, at up to 95% efficiency.

MODEL F

Medium capacity of 7½ pounds per hour, at over 90% efficiency.

Ask for the Spraywelder Catalog

HARD-SURFACING & BRAZING ALLOYS

WALL COLMONOY CORPORATION
19345 JOHN R STREET • DETROIT 3, MICHIGAN

Buffalo • Chicago • Houston • Los Angeles • Morrisville • New York • Pittsburgh • Montreal • London, England

For More Information Circle No. 76 on Reader Service Card.

ers and generators. The machine can weld up to 5½ fpm; and for some welded profiles, save up to 40 percent compared with rolled beams.

Circle No. 216 on Reader Service Card.

Heavy-Duty Tig Torch

Tec Torch Company, Inc. has developed a new tungsten inert gas welding torch capable of continuous work at between 1 and 500 amps. Called Tec 421, torch features: 1-piece construction, torch tip cooling (no cooling-off period necessary), and adaptability to all standard Tec Vycor nozzles and chucks. The Tec 421 is only 9 inches long, weighs only 5½ ounces.

Circle No. 217 on Reader Service Card.

Piercing Electrodes

Electrodes that cut, gouge, channel, and pierce any metal are available from Stulz-Sickles Co. Some of the many uses: cutting out rivets and rusted bolts, weld joint preparation, gouging out defective welds, making holes, veeing out cracks in cast iron and dies before welding, and trimming castings. Electrodes take a standard d.c. welder, and nothing more.

Circle No. 218 on Reader Service Card.

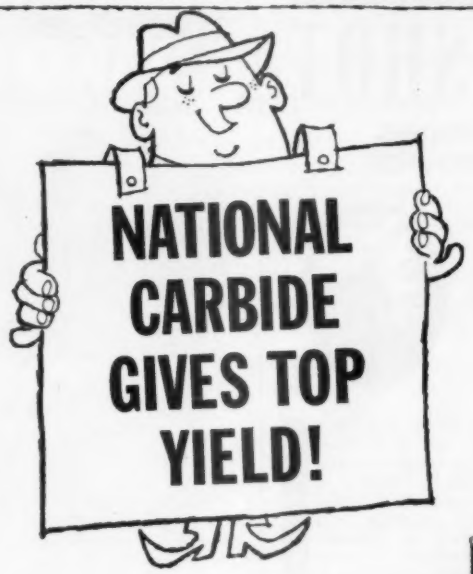
Constant Potential Welder

A new welder, the CP-750, has been introduced by Miller Electric Mfg. Co. The 750-amp unit features five voltage ranges with fine adjustments within each range and is said to do superior Mig work on light plate, to heavy structural pieces.

Standard equipment: voltmeter and ammeter, a 2KA 115v a.c. power supply with power receptacles for wire feed equipment or travel carriages, and a contactor control receptacle. Company also offers a 1,000-amp version of this CP welder for automatic work.

Circle No. 219 on Reader Service Card.

For More Information Circle No. 2 on Reader Service Card.



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All sizes, in quantities from 2 lb. pkgs. to 5 ton hoppers.

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WELDING DATA BOOK

1962/63 EDITION

Time after time, you'll find the answer to your welding problems in the WELDING DATA BOOK. Engineers use it as a guide in welding and fabricating all metals. Buyers and specifiers of welding, cutting, and brazing equipment and supplies find it indispensable as their direct line to sources of supply. Order yours now . . .

PRICE: $12.00 in USA

WELDING DESIGN & FABRICATION
812 HURON ROAD
CLEVELAND 15, OHIO

Dirty Oxide-Scale Problem?

USE CHEMCLEAN "536"

- Prepares Stainless and Aluminum for Welding.
- Removes Scale and Oxides before or after Welding.

Eliminate costly, time-consuming grinding, scratch-brushing, or sanding on *Stainless Steel.* Simply wipe oxide off with one or two strokes of hand applicator. Clean small parts by dipping. For *Aluminum* just wipe with or dip into "536" at room temperature.

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INDUSTRIAL CHEMICALS AND SPECIALTIES

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Circle No. 63 on Reader Service Card.

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HARDENING COMPOUND

Harden ferrous alloys this fast, economical way; get a file-hard case with amazing tensile strength, yet retain dampening capacity of the tough metal core. HOT SHOT holds scaling and distortion to a minimum, quenching at temperatures below those required by most methods. It's non-poisonous. Use it on:

- Machine steel and cold rolled
- Low carbon steels—cast iron
- Stainless steels
- Water-hardening steels
- Oil-hardening tools and die steels

Precision Chemical Works
Division of
CHEKER STAMPING & MFG. CORP.
238 Murray St. Newark, N. J.

Well-Stacked Resistors

A new series of 1-operator Weldline resistor stations for multi-arc welding is offered by J. B. Nottingham & Co., Inc. Stations have square housings for stacking, permit operator to control current from a multi-arc source in five- or 10-amp steps. Stations can also be used for gas shielded tungsten arc, consumable electrode, and other processes.

Circle No. 220 on Reader Service Card.

Wire Feeders

Two new Filler-Wire feeders for automatically feeding cold filler wire in gas tungsten-arc (Heliweld) and gas metal-arc (Aircomatic) welding are available from Air Reduction Sales Company. The feeders can be used for both automatic and semi-automatic welding. The Model HMF-A Feeders are alike except for speed: One feeds 12 to 48 inches of wire a minute, the other, 20 to 140 inches a minute. Used with HMD-D Control, the feeders give stepless control of wire speed. Units handle 0.020 to 1/16-inch hard wire and can be easily changed from one type and size to another.

Circle No. 221 on Reader Service Card.

Fail-Safe Electrodes

Welding electrodes for critical work, such as nuclear components, are of-

Swiss Flame Cutter Proves Important Advantages in American Plants

Get the facts about Gloor *Expeditor*—the most versatile, reliable, and easily used cutting machine you can add to your plant. Advantageous for welding shops, experimental departments, to supplement larger and slower equipment—in fact wherever metal is fabricated and time is important. Many exclusive advantages, superior engineering and craftsmanship. Cuts direct from drawings. Free demonstration anywhere.

GLOOR EXPEDITOR

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For More Information Circle No. 29 on Reader Service Card.

NOTCH 12 PIPE ENDS *per* MINUTE *with* ARC-FIT®

Mounted in hand press with portable stand.

Complete unit with adapter mounted in punch press.

ARC-FIT notching makes perfect joints for welding or brazing.

The Arc-Fit cuts clean contours for "T" joints in seconds . . . without deformation . . . no finishing is required. Mounted in hand or power press it readily notches 12 pipe ends per minute . . . 750 per hour.

A standard Arc-Fit with easily interchangeable dies (one for each contour) notches pipe ranging up to 2" O.D.; or tubing up to 2½" O.D. Special Arc-Fits are available for larger sizes, angles other than 90°, slotting, notching square pipe and for angle iron or flat stock.

Ask for literature. For quotation send sample or drawing of part.

VOGEL
VOGEL TOOL & DIE CORPORATION
1819 North 32nd Avenue, Stone Park, Illinois

For More Information Circle No. 75 on Reader Service Card.

fered by Arcos Corporation with 100% inspection and high visibility markings. Each electrode is Fail/Safe tested and marked with its AWS grade designation in several places. The electrodes are packaged in hermetically sealed cans with highly visible identifying tape. The tape cannot be removed without leaving signs of its removal.

Circle No. 222 on Reader Service Card.

Edge Preparation

A new plate edge preparation unit, the Linde PE-1, capable of cutting a variety of plate edge profiles has been introduced by Linde Co., Division of Union Carbide Corp. Using standard machine torches with acetylene, natural gas, or propane, the new attachment can accurately cut straight edges as well as single bevels, double bevels, or nose bevels. Cutting accuracy with the new machine is assured with a wheel that maintains nozzle-workpiece distance, regardless of surface.

Maintenance is easy due to the simplicity of the new attachment. A T-bar design provides ready access to all controls for adjusting nozzles and gas flows for three torches. Many types of installations are possible with the new attachment.

Circle No. 223 on Reader Service Card.

Arc Welders

Two new heavy-duty fan-cooled 250 and 295 amp arc welders (Models 41 and 42) have been announced by the Twentieth Century Mfg. Co. Features include: Precision dial control, transformer that starts easily and operates smoothly, steel block shunt that can't burn or wear out, and insulation that assures long life performance. Welders are also equipped with dial lights and a 110 volt outlet for power tools or lights. Units carry a one year continuous-welding guarantee and a five year service warranty.

Circle No. 224 on Reader Service Card.

For More Information Circle No. 4 on Reader Service Card.

STEELARC

CUTTING ELECTRODE

CHAMFER ROD

the versatile electrodes for field work to JOIN · CUT · SHAPE

Used extensively in construction • road building • farming mining • job shops • maintenance work

STEELARC® is All-State's specially coated electrode for all mild steel work —flat, vertical, overhead positions. Pass on pass without slag removal. AC or DC. One rod inventory.

All-State CUTTING ELECTRODE for fast, economical arc cutting of steel, cast iron, stainless, high chrome armor plate. AC or DC.

All-State CHAMFER ROD for chamfering, gouging, bevelling, routing and channeling without oxygen or air. Made with special compounded flux coating to protect rod and speed work. AC or DC.

High speed Cutting Electrode slices through cast iron machine housing. This one low-cost electrode cuts any ferrous alloy, lowers inventories.

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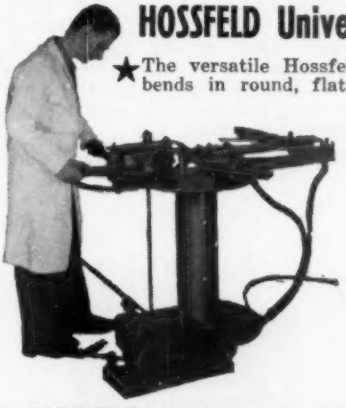
ALL-STATE WELDING ALLOYS CO., INC.
White Plains, N.Y. Dial 914 WH 8-4646
QUALITY WITH SERVICE

make hundreds of bends

(simple–tough–complex★) with a

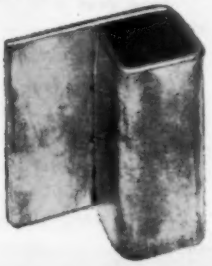
HOSSFELD Universal® Iron Bender



★The versatile Hossfeld Universal Bender makes hundreds of bends in round, flat or square bar stock, angle iron, pipe, tubing, and conduit. It's invaluable for maintenance, limited production work.

OVER 150 STANDARD DIES

Practically any everyday bend can be reproduced by the Hossfeld with one of the more than 150 standard dies available. This versatile Hossfeld bender sets up quickly, and is wrenchless for ready use. It's as indispensable as bench vise.



This difficult bend in 4" flat stock was made easily, accurately.

3 MODELS Available in a model to fit your particular needs: Hossfeld No. 1 for light shop work, Hossfeld No. 2 for heavier work, Hossfeld No. 2 with hydraulic attachment for tough hard-to-pull bends on heavy material.

FREE Illustrated Bender Bulletin. Write for yours today.

HOSSFELD MFG. CO.

436 WEST 3rd STREET • WINONA, MINNESOTA

For More Information Circle No. 43 on Reader Service Card.

WELD WITH Tipaloy

YOUR Resistance Welding Electrode NEEDS Are OUR Business!

Whether it be:
TIPS:
ROD or BAR:
SEAM WELDING WHEELS:
FORGINGS:
CASTINGS:
HOLDERS:
ADAPTERS:

SPECIAL WELDING DIES or FIXTURES: TIPALOY *has them.*

BUY TIPALOY and save money!

TIPALOY can supply you with:
RWMA Class #1, Tipaloy #100
RWMA Class #2, Tipaloy #130*
RWMA Class #3, Tipaloy #200
and other RWMA classes of alloys to fit your needs.

It is unwise to pay too much, but it is worse to pay too little!

Use TIPALOY and get 30% to 100% more performance for your money than you are now getting.

BUY TIPALOY and get TIPALOY QUALITY

Send your trial order today

*TIPALOY #130 cast and processed under our patents.

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Distributors and Representatives. Write for complete information about available territories.

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Circle No. 72 on Reader Service Card.

Welder's Gloves

A new, genuine buckskin welder's glove has been introduced by Singer Glove Manufacturing Co. This leather is soft, supple, lightweight, gives the operator "feel", yet is bulky enough to insulate and give heavy-duty service. Also, the glove's 1-piece back insures long life. Line includes gloves, mittens, and a driver's glove which is good for light welding and general work.

Circle No. 232 on Reader Service Card.

Rectifier Welder

A new "Lowboy" silicon d. c. rectifier welder for arc welding, cutting, or gouging has been announced by Hobart Brothers Company. One dial controls the welding range of the machine which has no moving coils or cores. Optional hand or foot control can be made operational by flipping the remote control switch on the control panel.

Low design and rigid construction permit stacking for parallel operation or to conserve space. Lowboy, which comes in 200 and 300 amp models with 60% duty cycle ratings, features permanently sealed silicon rec tifiers, a built-in surge protector, and overload protection.

Circle No. 225 on Reader Service Card.

Press Brake Takes A Lot Of Tooling

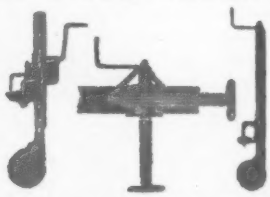
A new 150-ton capacity press brake boasting of a 60- by 216-inch die area

a constant source of business for you . . .

A complete line of - Axle Assemblies, Trailer Undercarriages, Farm & Trailer Jacks, Implement & Trailer Couplers, Spindle End Assemblies

BULL DOG AXLE ASSEMBLIES

BULL DOG JACKS



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A COMPLETE LINE OF COUPLERS

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Complete Spindle End Assemblies for 2,500, 4,000 and 5,000 lb. capacities Per Pair. Available in complete assemblies or individual parts — Spindle Ends, Hubs, Wheels.

Contact our engineering department for full details on your particular application — a FREE service to you — write for Catalog 18R

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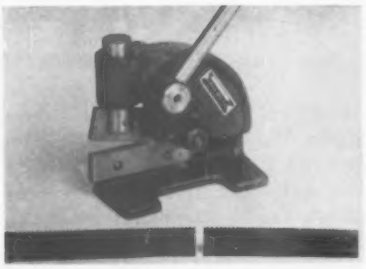
WAUSAU • WISCONSIN

Circle No. 36 on Reader Service Card.

for multiple punching, piercing, and blanking of large steel sheets, has been developed by Dreis & Krump Mfg. Co. The machine has a 2-plate, cross-ribbed box-type slide and a 2-plate cross-ribbed bed. This Chicago press brake is available in capacities up to 500 tons.

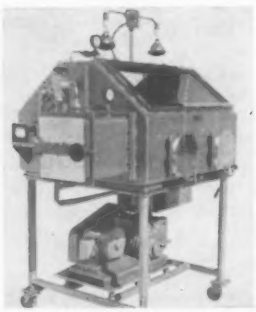
Circle No. 226 on Reader Service Card.



Precision Shear

A new bandsaw shear, developed by Stryco Mfg. Co., cuts up to 2 inch widths and is provided with replaceable tool steel blades. Mounted on a bench, it will make square cuts without bending or crimping and insures correct matching of blade ends. The Stryco cutting shear is used not only in saw shops, maintenance departments, and supply houses, but also in metal working plants for general purpose and as a throatless shear.

Circle No. 227 on Reader Service Card.



Inert Gas Welding Enclosure

An inert gas welding enclosure, Eringard Model MK11, has been announced by Royal Research Corp. Of heavy steel construction, the Eringard unit is equipped with four eight-inch diameter Erinseal glove ports that permit two operators to work simultaneously. Selected inert gases can be used with this system. A low leak rate of less than one micron per-minute, at a pressure of one micron, assures maximum purity. Other features include a gas-tight interchange vestibule.

Circle No. 228 on Reader Service Card.

For More Information Circle No. 18 on Reader Service Card.

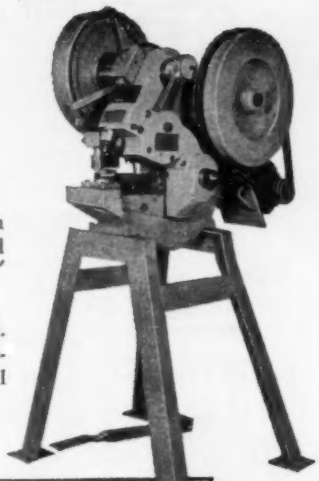
Large and Small Fabricators of steel and ornamental iron swear by it ...

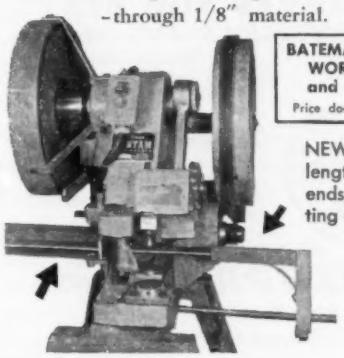
BATEMAN BANTAM IRON WORKER

The Bantam cuts and punches fast and clean . . . no grinding necessary. It's versatile, and saves time and labor! Cuts 2" x 2" x 1/4" angle and 1/4" x 4" flats.

Punches 1/2" hole through 1/4" material. Operates by hand or foot, uses 3/4 hp motor (1750) rpm., powered with flywheel and drive gear.

The Coper will cope 1-1/4" -through 1/8" material.





BATEMAN BANTAM IRON WORKER, with motor and stand $575.00
Price does not include Blades, Punches or dies.

Shp. Wt. 750 lbs.

NEW ACCESSORIES: Gauge for cutting to length, Guide for Flat Bars for cutting on ends, and Angle Iron Trimming Guide, for cutting at a 45 degree. Write for details.

WRITE TODAY for complete information and name of nearest distributor

Bateman Foundry & Machine

MINERAL WELLS, TEXAS

THERE GOES 30% MORE GAS

In the plant or on the truck . . . **you will move 30% more acetylene gas** — if the gas is in Coyne Acetylene Cylinders because there is a bonus of 30% extra gas capacity in **every** Coyne Cylinder. NOW is the time to increase your gas profits and decrease labor costs with this extra gas footage. Write or call for the facts on the complete line of Coyne extra capacity acetylene cylinders.

COYNE cylinder company
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For More Information Circle No. 26 on Reader Service Card.

For More Information Circle No. 77 on Reader Service Card.

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Braces
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Plugs
Screens
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Tees
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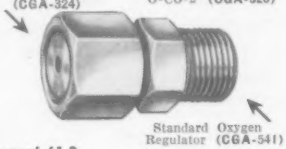
NEW . . . Special Regulator Adaptors

ITEM NO. 804 (CGA 540-320) Adapts Standard Oxygen Cylinder to Old Medical Oxygen Regulator.

Old Medical Oxygen Cylinder (CGA-324)

Old Medical Oxygen O-CO-2 (CGA-320)

ITEM NO. 805 (CGA 320-540) Adapts Old Medical Oxygen Cylinder to Standard Oxygen.



Standard Oxygen Regulator (CGA-541)

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FREE CATALOG
Contains 200 fitting illustrations, prices. Write Dept. D . . .

Your Welding Supply Distributor
SERVES YOU BEST
with WESTERN BRAND Fittings

. . . Because these are *quality* brass fittings manufactured to exacting specifications . . . completely inspected . . . individually packaged to protect quality and coded for easy stocking . . . shipped to distributors on day of order from an inventory of 2,000,000 parts.

"Look for the WESTERN BRAND"

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BECKER
HAS IT...OR CAN MAKE IT—
if it's CARBON or GRAPHITE!

Graphite Cores and Chills—Graphite Powder and Particles of any mesh . . . complete Graphite Fabrication Facilities.

BRUSHES . . . for all motor and generator applications . . . carbon, graphite, copper leaf, gauze and metal-graphite.

WELDING ELECTRODES, WELDER BRUSHES . . . Keen-Cut Electrodes for carbon arc-air jet cutting . . . Keen-Arc Carbons, cored and heavily copper coated, for twin-arc torches . . . paste, rods and plates.

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AMERICA'S FINEST AND NEWEST MANUFACTURER OF BRAZING ALLOYS INVITES YOU TO TRY OUR ALLOYS . . .

LOW FUMING BRONZE
NICKEL SILVER
SILVER SOLDER
PHOSPHOR COPPER
PHOSPHOR SILVER
SILICON BRONZE
NICKEL BRONZE
ALUMINUM WELDING WIRE

Our alloys are made in strict accordance with AWS, ASTM, and Federal specifications. Request samples on company letterhead. Write for this free catalog today.
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LIBRARY

of welding

Copper, Copper Alloys

"Compilation of ASTM Standards on Copper and Copper Alloys—B-5," 18th edition. Order from American Society for Testing Materials Headquarters, 1916 Race St., Philadelphia 3, Pa. 746 pages, hard cover, 6 x 9 inches, $9.25.

This compilation contains 134 standards of which 37 are new, revised or have had their status changed since the previous edition in 1959. In addition to standards for cast and wrought copper and copper alloys, the book contains some material on non-ferrous materials for electrical conductors, certain selected specifications on non-ferrous metals, and alloys for primary forms of copper, zinc, lead, and nickel used in copper-alloy products.

Typical of the topics covered are copper and copper-alloy plate, sheet, strip, and rolled bar. In addition rods, shapes and die forgings as well as wire, pipe, tubes, and ingots are included. Among the new standards are specifications for: nickel-coated soft or annealed copper wire; copper-nickel alloys in ingot, slab or shot form; and copper and copper-alloy seamless condenser and heat exchanger tubes with integral fins.

Use of Abrasive Grains

The Abrasive Grain Association is preparing a series of booklets explaining the composition and the major uses of abrasive grain. The booklets are being written by M. M. Patterson and will be published later this year.

Two of the booklets cover the history and the physical and chemical properties of abrasive materials. Each of the others is concerned with some phase of their use—in bonded and coated abrasives, blasting, barrel finishing, super-refractories, wire sawing, and polishing.

Each one of the end-use pamphlets will discuss the purpose of abrasive grain in each operation, the factor influencing its use, the types of abrasive grains used and the reasons for their use, and the methods of application.

Circle No. 45 on Reader Service Card.

Symbols for Welding

V-Weld Arrow Side | V-Weld Other Side | V-Weld Both Sides

Symbol of Quality

HI-AMP

Only Ground Clamps by HI-AMP have a tough spring that can't knock out. Broad contact base means a better ground and better welding results. Wide opening jaws fit any shape. Made of high copper alloy.

FREE Large 8½x11 chart shows symbols for arc, gas and resistance welding.

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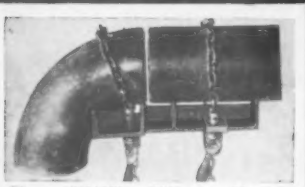
LENCO, INC.

350 West Adams Jackson, Mo.

SEE JEWEL FOR . . .



The JEWEL Elbow Clamp lines up welding elbows from 2½" to 8" at right angles to the pipe and holds them until tacked.

The JEWEL Angle Clamp holds branch line at right angles to the main or headers. Takes any size main or branch from ½" to 12".

The JEWEL Flange Clamp lines up the flange face at right angles to pipe end and holds until tacked. Takes size from 2½" to 16".

The JEWEL Pipe Clamp . . . aligns and holds pipe for tacking. Two sizes: ½" to 8" and 8" to 16". Sturdy construction for hard usage.

The JEWEL Pipe Marker marks a perfect hole and saddle on any pipe up to 20".

Write For Details

Jewel Manufacturing Co.

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ECONOMIES of hardsurfacing are explained by Alloy Rods Company's C. C. Hand to designers, engineers, and maintenance superintendents as . . .

Alloy Rods Company's Mobile Classroom Teaches Surfacing

CLEVELAND, OHIO: Alloy Rods Company's mobile welding lab and classroom stopped in Cleveland last month during its nationwide tour. The trailer-housed set-up is used to demonstrate hard surfacing techniques and to explain the selection of wear-resistant alloys. It consists of a 35- by 8-foot custom-built trailer and includes a sealed-off welding lab and a classroom with 12 desks and chairs, built-in projectors for slides and films, screen, and blackboard for illustrating classroom discussions.

While in Cleveland, the trailer classroom was used at the Arthur G. McKee Company to explain surfacing and surfacing techniques to McKee engineers who design industrial plants. Other stops were made at U. S. Steel's American Steel & Wire Division and Cuyahoga Works; Jones & Laughlin Steel Co.; and at McDowell Co., Inc. In all, 125 designers, engineers, and maintenance supervisors attended.

Courses were conducted by C. C. Hand, district manager of Alloy Rods' Hardsurfacing Division; W. F. Stewart, Cleveland sales representative; and Larry E. Hollinger, welding technician.

Introduced at the AWS Welding Show, the classroom on wheels will tour the country, visiting users of hard surfacing materials and Alloy Rods' distributors.

more news on page 80

Circle No. 20 on Reader Service Card.

WATER COOL welding equipment THE RIGHT WAY . . . THE BERNARD WAY!

SAVE MONEY...
SAVE YOUR EQUIPMENT...
INCREASE PRODUCTION...

. . . with the right method of water cooling for your equipment. Bernard, the leading name in *self-contained* coolant circulators, offers eleven individual models for immediate delivery . . . one for every type and size of welding application.

TIG MIG (Gun) AUTOMATIC SPOT INDUCTION

CLIP AD, FILL OUT AND MAIL FOR: free catalog and pamphlet, "The use of Water Cooling for Welding Equipment".

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BERNARD WELDING EQUIPMENT CO.

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Photo Courtesy The Lincoln Electric Co.

NOW . . .

ONE AMMETER for AC/DC WELDERS

Only TONG-TEST measures both AC and DC

Weld with confidence. Use the exact amperage — no more, no less — to assure welding quality. Prevent costly rejects by controlling the welding current (AC or DC) with one TONG TEST AMMETER. Simply snap tongs around electrode cable — read amps instantly and accurately. No electrical connections required, cannot burn out. Interchangeable ranges up to 1000 amperes.

Write for Catalog W-400

COLUMBIA ELECTRIC MFG. CO.

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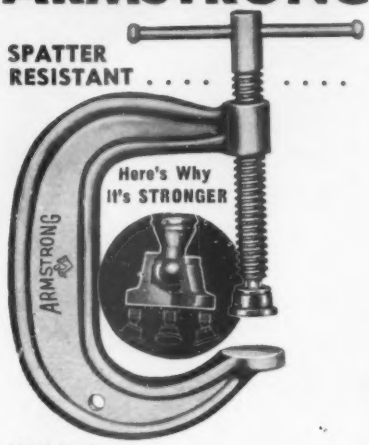
Circle No. 14 on Reader Service Card.

ARMSTRONG

SPATTER RESISTANT . . . .



Welder's
C-CLAMP with the New Ball-joint Swivel Pad
that can't come off

These finest welder's clamps have every quality and convenience feature: Extra deep throat. Extra stiffness and strength—drop forged steel, heat treated. Cadmium plated *all over*—spatter resistant. Drilled for ground. And, the exclusive, ARMSTRONG 1-piece, formed-on swivel pad that can't work, pry or knock off. 8 sizes: capacities to 12" opening. Specify ARMSTRONG Spatter Resistant Welder's "C" Clamps for safe, lifetime service. There are no better.

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No matter how you use Arcair you'll get best results *only* with genuine Arcair *COPPERCLAD* electrodes — because Arcair electrodes are the finest the world's largest carbon research laboratory has been able to develop.

Arcair electrode quality is consistent, which means you get less breakage, highest resistance to thermal shock, maximum arc stability.

Insist on genuine Arcair *COPPERCLAD* electrodes. Available from your welding supply distributor in all standard sizes. Special sizes by request.

®Reg. Trademark

THE *Arcair* COMPANY
Dept. 29, Box 406, Lancaster, Ohio
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BILL RICE (right) helps Governor Wallace Barron of West Virginia cut the chain that formally opens the West Virginia Mining and Industrial Show at Charleston.

8,000 Attend Industrial Show in West Virginia

CHARLESTON: Eight-thousand executives and technical men registered for the second biennial West Virginia Mining and Industrial Show held here last September. William A. Rice, president of Virginia Welding Supply Co., was chairman. He was also chairman of the first show staged in 1959 at the Grand Arena of Charleston's Civic Center.

Profits from the show are used to support the Industrial Development Department of the Charleston Chamber of Commerce.

Plans are now underway for the 1963 show which will be a part of West Virginia's Centennial Year. After 1963, Rice reports, the show will change to a 3-year schedule.

New Distributors And Sales Representatives

Linde Company, Division of Union Carbide Corp., New York City: Colony Welding Supply, Quincy, Mass.

Hamilton Tool Co.: Ray R. Spaulding, Petersburg, Florida.

National Electric Welding Machines Co., Bay City, Michigan: R. E. Duboc Associates, Salt Lake City (new sales office).

Circle No. 40 on Reader Service Card.

"What's the secret of your strength, HERCULES?"
"No secret – I use only virgin alloys in my spotwelding tips and machine them with the best equipment money can buy."

Resistance Welding Alloys our only product. An abundant inventory of spotwelding tips and related accessories, as well as the various grades of copper-alloy bar stock, maintained at all times.

tips—holders—wheels—copper alloy bar stock, forgings and castings

Catalog Available On Request

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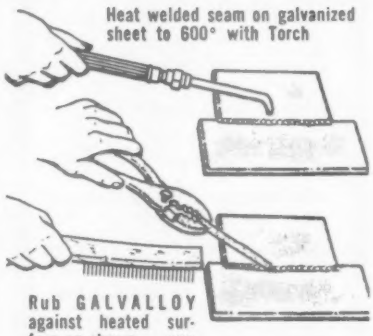
No Other Product Can Do a Galvanizing Job Like *Galvalloy* Does – HERE'S PROOF

Heat welded seam on galvanized sheet to 600° with Torch



Rub GALVALLOY against heated surface as shown — now spread with wire brush for a bright finish.

GALVALLOY Covers the Same Amount of Area with 1/5 the Amount of Material.

Send today for Testing Sample and you'll learn Why GALVALLOY has no equal for ANY Galvanizing Job.

METALLOY PRODUCTS CO.
1233 S. BOYLE AVE., LOS ANGELES 23
Circle No. 51 on Reader Service Card.

NEWS BRIEFS

SANTIAGO, CHILE, is the destination for two oxygen plants and an acetylene generating facility shipped recently by Airco Company International. The plants will go on-stream later this year. The oxygen plants have total capacity of 142 tons per month; acetylene plant, 4,800 cfh.

A COMBINATION OFFICE-WAREHOUSE has been built in St. Louis by the Lincoln Electric Co. It's the second of its kind built in a program to put this type of distribution facility in important industrial areas.

PALMETTO WELDING SUPPLY CO., INC., is the new name of Greenville Oxygen Supply Co. of Greenville, S. C. The company recently opened a branch office in Spartanburg, S. C.

A NEW HELIUM COMPRESSING PLANT has been opened in Portland, Oregon, by Air Reduction Pacific Co. The plant will get helium from wells in Texas and Oklahoma, process it, and distribute it in cylinders or cylinder trailers in Oregon, Washington, Idaho, and Montana.

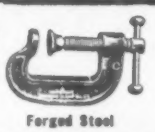
WELDING SUPPLIES FOR DISTRIBUTORS will be produced by newly-formed Welding Products Corp., Mt. Vernon, N.Y. Stan Schumann is sales manager for the company which will manufacture and distribute welding cable, welding hose, safety equipment, and related items.

DALWELD COMPANY, INC., Mt. Vernon, N.Y., has announced its debut as a processor of aluminum welding wire. New facilities include straightening and cutting machines, winding machines and degreasing tanks.

COMPLETION OF THE LARGEST liquid oxygen, nitrogen, and argon plant in the Pacific Northwest has been announced by Industrial Air Products Company of Portland, Oregon. The new plant, already in operation, ranks as the largest on the Pacific Coast operated by an independent gas manufacturing firm. Daily capacity of the highly automated operation is 70 tons—more than double IAP's previous Portland output.

HARGRAVE
Power Tested
WELDERS' CLAMPS

Spatter Resisting
Solid Alloy Screw
Drilled Frame
For Ground

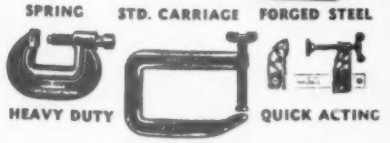


Forged Steel

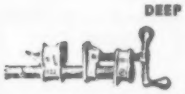
In 3 Patterns
Regular Duty
Deep Reach
Heavy Duty

A SIZE AND PATTERN FOR EVERY JOB

SPRING | STD. CARRIAGE | FORGED STEEL



HEAVY DUTY | DEEP REACH | QUICK ACTING



CLAMP FIXTURES for ½" and ¾" pipe

BAR CLAMPS Light to Extra Heavy Duty

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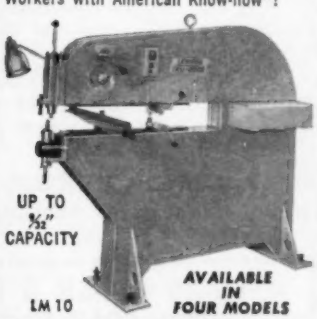

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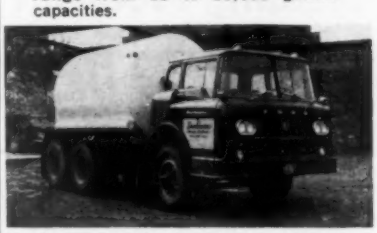

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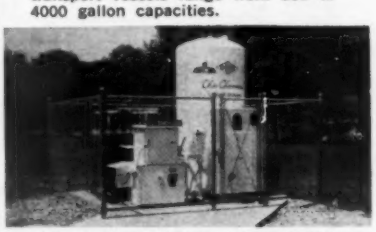

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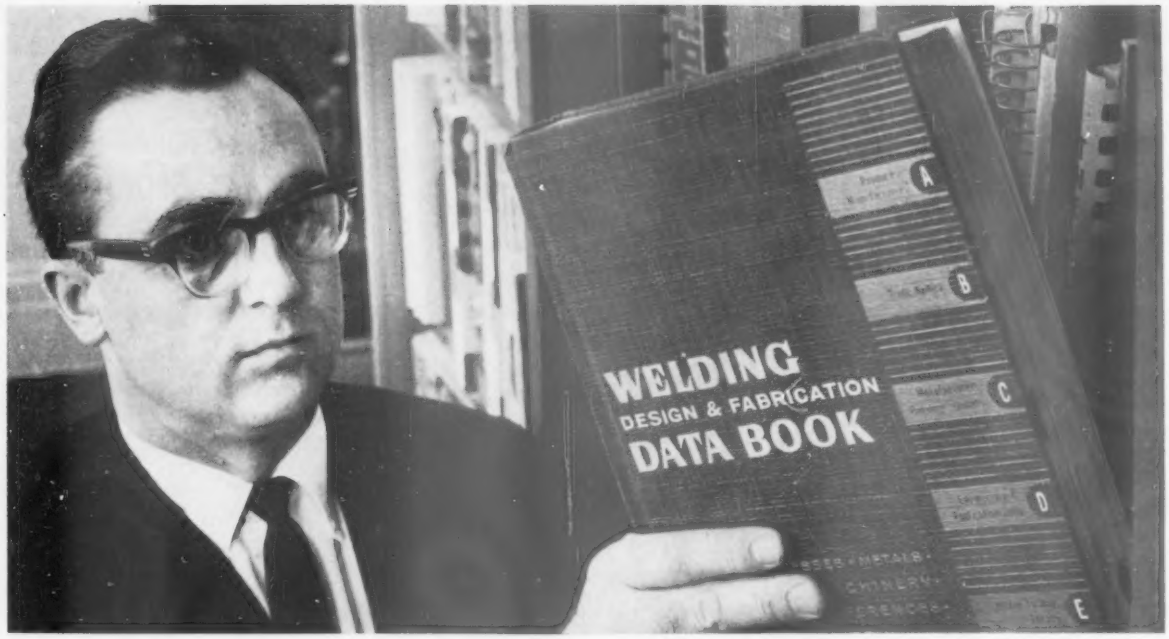

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Data Offered in This Month's Ads

Readers may obtain any of these free reference materials by circling the corresponding numbers on the Reader Service Cards

2: Calcium carbide is featured. Air Reduction Chemical & Carbide Co.

3: Spot welding tips and holders are featured in a catalog. Air Reduction Sales Co., Tuffaloy Dept.

4: Electrodes for joining, cutting, and shaping are featured. All-State Welding Alloys Co., Inc.

5: Welding low alloy, high tensile steels is the subject of a booklet. Alloy Rods Company

6: Brazing alloys are listed in a catalog. American Brazing Alloys Corp.

8: Welding helmets, goggles, and accessories are described in a catalog. American Optical Company.

9: Resistance welding products are featured. Ampco Metal, Inc.

10: Metal removing electrodes are featured. Arcair Co.

11: Quality control of filler metals is featured. Arcos Corp.

12: Stainless electrodes are featured. Arcos Corp.

13: Band-saw design and operation is described. Armstrong-Blum Mfg. Co.

14: Hold-down clamps are featured. Armstrong Bros. Tool Co.

15: Turning rolls are featured in literature. Aronson Machine Co., Inc.

16: Personalized service on steel fabrications is featured. Art Welding Co.

17: PlasmaGun metal spray coating is described in literature. Avco Corp.

18: Iron workers and accessories are described in literature. Bateman Foundry & Machine Co.

19: Carbon arc gouging is featured in literature. Becker Brothers Carbon Co.

20: Water cooling for welding equipment is the subject of literature. Bernard Welding Eqpt. Co.

21: Fume exhaust equipment is described. Blowers, Inc.

22: Power connectors are described in catalog. Cam-Lok Div., Empire Products, Inc.

23: Clamps for all jobs are featured in a catalog. Cincinnati Tool Co.

24: A tong-type a.c.-d.c. ammeter is featured in material. Columbia Electric Mfg.

25: Pipe layout equipment is featured. Contour Sales Corp.

26: Gas cylinders are featured in data. Coyne Cylinder Co.

27: Gaugeless regulators are described in literature. Dockson Corp.

28: Electrode holders are featured. Duro Engineering Co.

29: Automatic flame cutting is featured. Earth Equipment Corp.

30: X-ray inspection of welds is featured. Eastman Kodak Co.

31: Large capacity, multi-conductor cable is described in Ni-Coil cable. Electric Arc, Inc.

32: Portable nibblers for cutting all metals are featured. Fenway Machine Co.

33: Tungsten electrodes are featured in literature. General Electric

35: High-strength steel is described in literature. Great Lakes Steel

36: Axels, jacks, and couplers are featured in a catalog. Hammer Blow Tool Co.

37: Handy alloy data sheet is offered. Handy & Harman

39: Controlled flame cutting is described in literature. Heath Engineering Co.

40: Resistance welding alloys and tips are featured. Hercules Welding Products

41: Welder improvements are featured. Hobart Brothers Company

42: Liquefied gas storage and transportation vessels are featured. Hofman Labs., Inc.

43: Iron bender with 147 dies is featured in a bulletin. Hossfeld Mfg. Co.

44: Welding and safety equipment is listed in a catalog. Jackson Products

45: Arc, gas, and resistance welding symbols chart is offered. Lenco, Inc.

46: Shearing, forming, and piercing machine is featured in literature. Lennox Tool & Machine Builders

47: Welders and welding accessories are described in a catalog. Lincoln Electric Co.

48: Oxy-acetylene outfits are on special offer. Linde Co.

49: Welding distributors and how they serve local needs is described. Linde Co.

50: Tip cleaners are featured in literature. Maitlen-Benson, Inc.

51: Galvanizing weld is the subject of data. Metalloy Products Co.

52: Flame spraying hardfacing is described in a bulletin. Metco, Inc.

53: "Rectifiers for welding" is a pamphlet offered. Miller Electric Manufacturing Co.

54: Nationally known facilities, experience, and craftmanship are described in literature. Morgan Engineering Co.

Hold on there! Back up a bit: you just rushed by some pretty important information. Before you pass this copy of WELDING DESIGN & FABRICATION on the next reader check it over once more. Did you spot the New Products pages? How about selection of free data books and catalogs? The handy Reader Service card will bring you details on any item. Just fill it out and mail it.

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DATA FEATURED IN ADS

continued from page 83

56: Saucer shaped reinforced wheels with disposable mounts are described in literature. **Norton Abrasives**

57: Welding wire is described in folder DH-402 and DH-1218. **Page Steel & Wire Division, American Chain & Cable Co., Inc.**

58: Non-distructive testing methods are discussed. **Picker X-Ray Corp.**

59: Hardening compound for ferrous alloys is featured. **Precision Chemical Works.**

60: Seamless high pressure cylinders are described in catalog. **Pressed Steel Tank Co.**

61: Leak-proof hose connections are described in a catalog. **Punch-Lok Co.**

62: Hard surfacing of parts is featured. **Rankin Manufacturing Co.**

63: Backing rings for welding pipe are featured. **Robvon Backing Ring Co.**

64: Motor speed controls are featured. **Servospeed Div., Electro Devices, Inc.**

66: Weld cleaning is discussed. **G. W. Smith & Sons, Inc.**

67: Virtually undistructible torch is featured. **Smith Welding Equipment**

68: Transistorized welding controls are featured. **Square D Company**

69: Cut-off machines are described in literature. **Stone Machinery Co., Inc.**

70: Repair of worn equipment parts is featured in literature. **Stulz-Sickles Co.**

71: Tungsten electrodes for every welding need are featured. **Sylvania Electric Products Inc.**

72: Resistance welding electrodes are listed in a catalog. **Tipaloy, Inc.**

73: All size welding equipment is featured in a catalog. **Vickers, Inc.**

74: Victor grinders are described in data. **Victor Equipment Co.**

75: Slotting-notching of pipe, tubing is described in data. **Vogel Tool & Die Corp.**

76: Spraying-on hard surfacing alloys is described in a catalog. **Wall Colmonoy Corp.**

77: Gas fittings are featured in a catalog. **Western Enterprises, Inc.**

78: Blow torches are featured in literature. **Clements Mfg. Co.**

79: Clamps for various uses are described in literature. **Jewel Manufacturing Corp.**

80: Temperature indicators in adjustable holders are described. **Markal Co.**

81: Oxide scale problems are discussed. **Chemclean Products Corp.**

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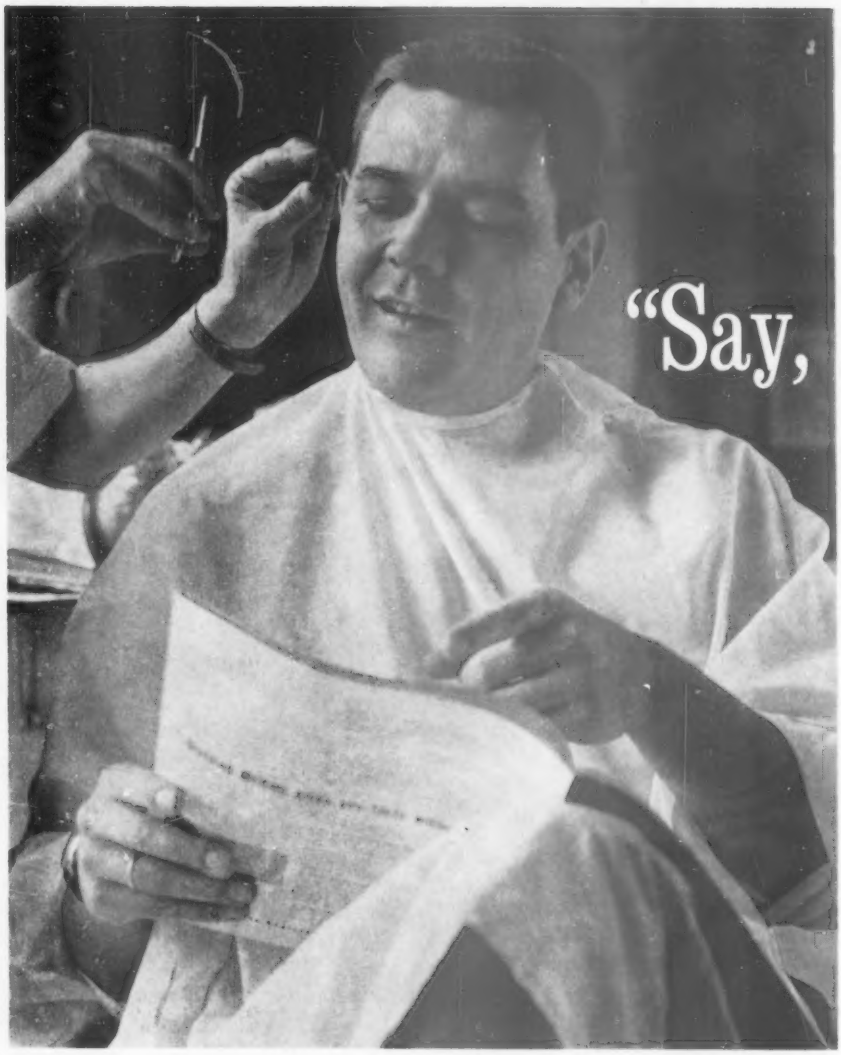

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